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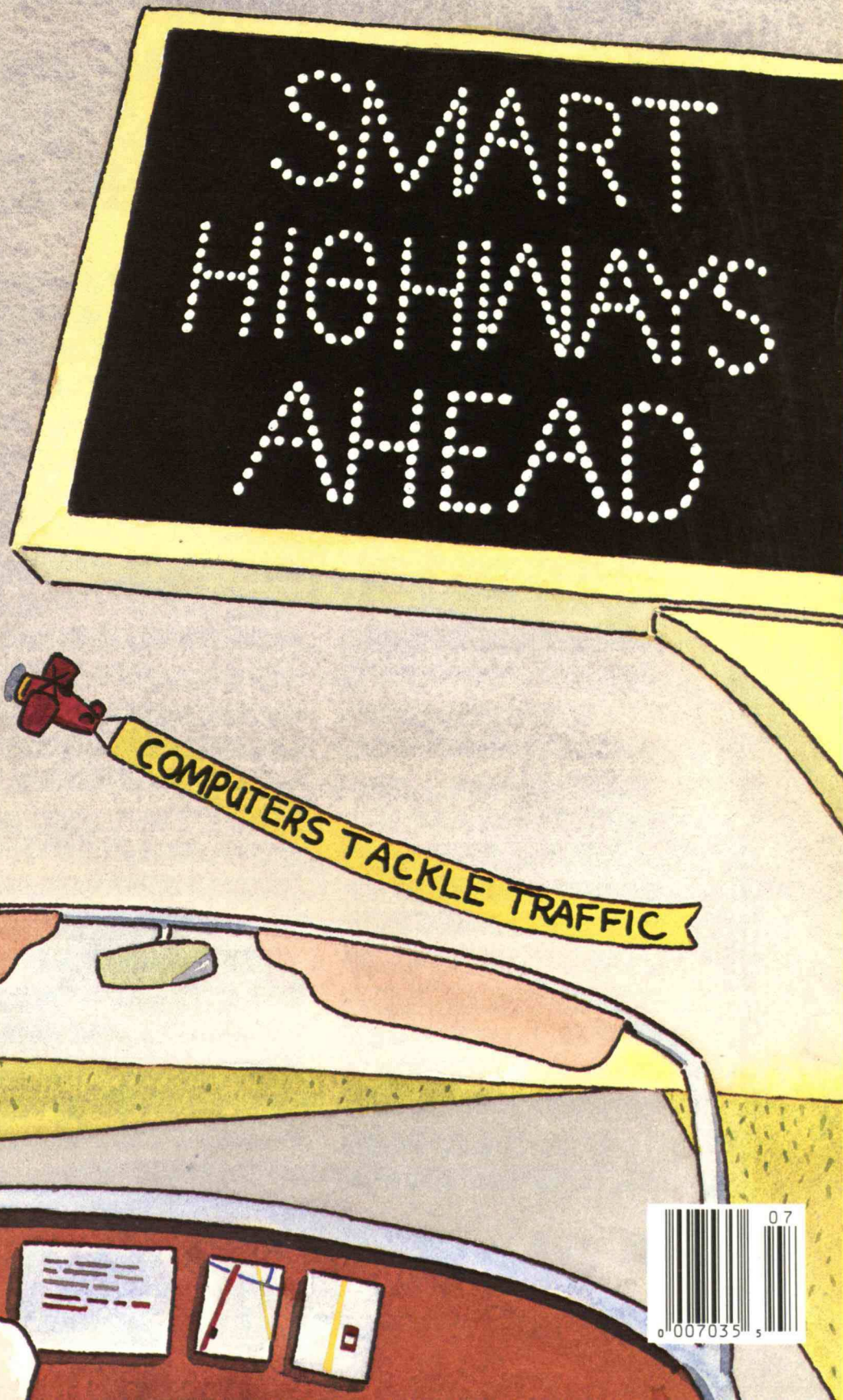
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OLD PLASTICS*

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technology review

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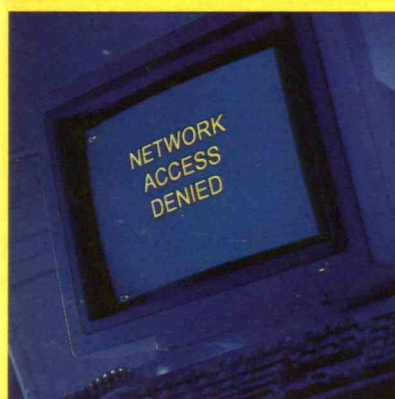
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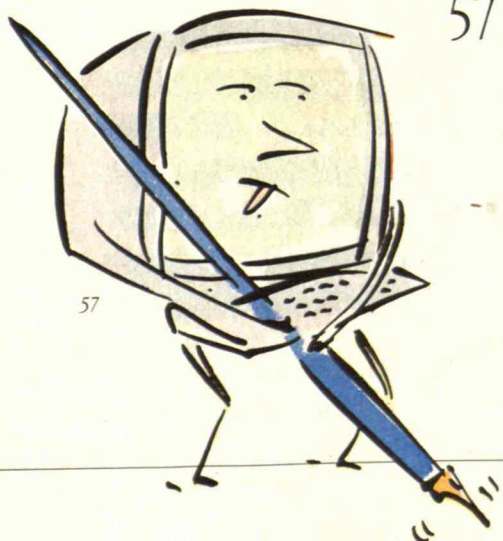


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First Line

No Failure to Communicate

WITH the death of Isaac Asimov early last April, we lost one of the truly great science writers. "His response to the public's increasingly anxious interest in science was his clarity and integrity," wrote Gerard Piel, former editor of *Scientific American*, in the *New York Times*. "He leveled with his readers, never condescended, and never overheated the story."

We may not see Asimov's equal again, but fortunately he left descendants. An experience I had the following week reminded me that we are blessed with many writers who report on science and technology in plain English for the pleasure and benefit of the public.

The occasion was my service on the selection committee of the Knight Science Journalism Fellowships program, which annually brings eight North American science writers (plus a few more from overseas) to MIT for an academic year. Liberated from deadline pressures, they pursue their own study agendas, make contacts with scientists and technologists, and generally take what the program's literature describes as "an energizing step in their careers."

The interview process alone was an energizing step—for the interviewers. Representing virtually all facets of the business—newspapers, magazines, television, and radio; urban and rural locales; posts foreign and domestic—the applicants were smart, enthusiastic, versatile, poised, dedicated, thoughtful, and articulate professionals. They embodied what I've long advised aspiring science writers, and what I'm privileged to see every day among my colleagues at *Technology Review*. That is, the journalist must deliver neither a sermon nor a tutorial but a "story." He or she must address the general public, people who don't yet know the scoop but who are intelligent and willing to learn—and act. And the presentation must be clear in style and balanced in content.

Telling a story, and telling it well.

One candidate, a newspaper reporter, had started his career as a novelist and therefore hit the ground running when he moved into journalism. "Fiction writing," he said, "taught me to tell a story, with structure, characters, and human dimension." Another candidate, a freelance writer, described a useful rule of thumb for identifying a good story. "I look for something with great verbs," she said, "an area that has motion and verve." And what are the

Let me tell you about my science-journalist colleagues.

earmarks of turning a good story, once selected, into a good read? "Reporting that's accurate," said another journalist, "coupled with writing that's simple, colorful, and clear."

Addressing the public. Some scientists see journalism as an exercise in oversimplifying, and the more mass the market, the greater the trivialization. That's because the details of the science and technology enterprise—as opposed to its ultimate products—have been thought not to interest the public. Actually, the applicants maintained, people are willing and able to follow the ups and downs of scientific inquiry and the adventures of the players. "Being caught up in the romance of science," said one reporter, "I try to convey the drama to my readers."

A revelation was that mass-market publications such as women's magazines are good outlets for substantive science writing. They are "definitely not of the 'McNuggets' school," observed a freelance writer. "They provide more room, and they're also more accurate." Beviess of fact-checkers are employed to validate every word.

The come-on in such magazines, said the writer, is their "service orientation"—what ordinary people can do to protect themselves, say, from possible

radiation hazards while differing experts battle it out. "Once they're in there," she noted, "readers don't mind getting into more depth."

Sparing us the sermons. Most applicants agreed that the journalist's job is to present information to the public, even help people decide what to do with it, but not beat readers over the head with his or her own world view. "I describe what the new technology is and why now," said a reporter/columnist. "But I play soothsayer with great reluctance." My goal, said another writer, "is to describe the details to get to the issues. When there's a point to make, experts do it for me."

A few interviews underscored the merits of American journalism—rich, almost to a fault, in expert sources and quotes—as opposed to the British press, for which some of the applicants occasionally wrote. Publications in the United Kingdom often suppress such detail for fear of burdening the reader and because they assume themselves to be "the authoritative voice."

During their year in academia, the Knight Fellows hope to find genuine authoritative voices and learn better how to translate and analyze them. These go-getters seem likely to obtain what they seek, and give as much as they get. That "energizing step" will be driven by an already abundant energy. "I'll eventually become an editor even though I love writing," said one prolific reporter, much to our surprise. "The reason is that I have so many ideas, I couldn't possibly pursue them all myself."

Of course, being charming in an interview is one thing and routinely delivering the goods for one's readers is another. Writers should be judged by the quality—the readability, accuracy, depth, and value—of their writing. And while it's nice to be acclaimed by colleagues, it is the public that must ultimately judge. Speaking as one of those colleagues, then, let me simply point out that the public has some smart and motivated science journalists vying to serve it. ■

—STEVEN J. MARCUS

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The inside story of minivan safety engineering.

Our safety engineers work with the most advanced technology available to reduce the chance of serious injury in the event of an accident.

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We also have a special safety feature for some very special passengers. The world's first built-in child-restraint seat, available on Caravan and Voyager. Our competition doesn't have anything like it.

Nobody likes to think about trouble on the road. But if it happens, you'll be glad our engineers spend every day thinking about it.

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In the automotive business you lead, follow, or get out of the way. Our aim is to lead by building our minivans better, building them safer, building them cleaner. So we can reach the only goal that really matters: a satisfied customer.



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Letters

REGIONALISM VS. LOCALISM

Frank J. Popper is to be commended for his article "Thinking Globally, Acting Regionally" (*TR April 1992*). He captures the essence of an important idea, presents it to us with eloquence, and thus provokes us in ways few academics or social commentators can.

However, at the root of his argument is an unfortunate presumption about regional planning. He rightly points out that local planning as it is practiced in most places has failed—that its nature, if you will, is socially irresponsible. Local planning in the United States seems to be inevitably parochial in content as well as elitist in implementation. Furthermore, it's based on units of political subdivision that have no relationship to real ecological systems. But to address this failure, Prof. Popper simply puts forward a notion of responsible regionalism. He hopes to ameliorate everything simply by moving planning up one administrative level.

The problem here is two-fold. First, such a strategy does not acknowledge the possibility of irresponsible regionalism, a critique raised by some scholars, including Prof. Popper himself in earlier work. Second, the focus is on an administrative issue, when instead it should be on one that's political, social, and cultural. Both regional and local planning are bound to be plagued by an unresolved social ethos about the balance of individual and social rights and responsibilities.

In fact, when we can successfully confront that ethos, we might just as well construct a responsible localism as a responsible regionalism. If we can learn to think globally, then let us act locally, as the original phrase urges. It is not only preferable, because of the unique nature of land resources, but it reinforces a democratic tradition that, while seeming anarchic and out of date, has rhyme and reason to it, even in the late twentieth century.

HARVEY M. JACOBS
Department of Urban
and Regional Planning

University of Wisconsin-Madison

COMPUTERIZED CIVIC ACTION

In "Electronic Democracy" (*TR November/December 1991*), Pamela Varley focuses on the extreme political views communicated through Santa Monica's Public Electronic Network (PEN). She doesn't describe how the network is making the city more livable.

As a resident of Santa Monica, I have used PEN for the past two years to address messages to city officials. I have improved electronic-mail reservations of books at the public library, prevented local hotels from dominating our public tennis courts, caught vandals at one of our public schools, and helped set specifications for the rewiring of our street lights. I have had a slippery stretch of street grooved to prevent skidding, and tried unsuccessfully to outlaw audible burglar alarms.

This is true electronic democracy.

MYRON KAYTON
Santa Monica, Calif.

POLICY AND POLITICS

In "Building a New Economic Order" (*TR April 1992*), Ann Markusen and Joel Yudken rightly conclude that the nation needs a visionary technology policy. Unfortunately, however, they propose no such thing, falling back on tired, old ideas. They assume that wars will go away and our international industrial competitiveness will return if only we would invest in socially useful areas instead of "wasting" money on defense. They are also under the impression that when the government mandates such changes as high-cost labor in foreign countries, America's economic, security, and social problems will all be solved.

The U.S. technology policy clearly should be socially responsible. But the difficulty will be to keep it out of politics, and Markusen and Yudken have followed the well-worn political path of trying to save the non-critical and dying industries where the current jobs (and, therefore, votes) reside. They do not face up to the difficult choices inherent in crafting a policy that's truly visionary—one focused on the critical technologies and industries of the future. Also, by

including such areas as preventive health care, employment, and social welfare under the umbrella of a technology policy, the authors press technology well beyond the sphere in which it can be the dominant force. Much more than technology is required to solve America's problems, though the country does need a truly visionary technology policy.

JACQUES S. GANSLER
Senior Vice-President
The Analytic Sciences Corp.
Arlington, Va.

STONEWALLING ON SMOKE

In "Keeping OSHA's Feet to the Fire" (*TR February/March 1992*), Charles Noble does an excellent job of reporting on the agency's failure to protect against occupational hazards. My own special interest in this area is environmental tobacco pollution. Since the surgeon general's report on environmental tobacco and health in 1986, there have been 1150 articles in the medical literature that address this issue, yet OSHA has done nothing.

In 1987 Action on Smoking Health (ASH) filed a citizen's petition to request OSHA to limit smoking in the workplace. Two years later, the organization's request for an emergency temporary standard was turned down, but the court did find for ASH in that it asked OSHA to develop some standards. In 1992 OSHA is to finally start its inquiry into the issue.

STEVEN A. PICKERT, M.D.
Thurmont, Md

FEELINGS FOR ANIMALS

As Harriet Rivro suggests in "Toward a More Peaceable Kingdom" (*TR April 1992*), the scientific establishment has done a poor job of enlisting public support for using animals in research despite the impressive array of advances—such as insulin and the polio vaccine—that can be called upon as examples. In part, this is because of the condescending attitude that she mentions. But another important aspect of the problem is that scientists have difficulty communicating how they themselves feel about animal suffering.



In fact, scientists and their staffs are also disturbed by animal use. Yet relatively few spokespersons have been willing to admit their concern explicitly and convincingly, perhaps because most of them have developed psychological mechanisms that separate their everyday feelings from their laboratory personas. These mechanisms, which allow them to do things to a laboratory dog they would not countenance if it were the family pet, are normal, but they can be misinterpreted. And to make matters worse, the scientists go on to decry the "irrational and emotion-laden" claims of animal activists, shift the focus to the benefits of research, and simply ignore or downplay questions about animal use. Thus they perpetuate the caricature of the scientist as an objective but unfeeling seeker after the truth. It is not surprising that the members of the public, who overall support biomedical research, should nevertheless be uneasy.

ANDREW N. ROWAN
School of Veterinary Medicine
Tufts University

Harriet Ritvo makes a compelling case for the idea that the appeal of antivivisectionism rises as people become more skeptical about science. Judged by this yardstick, the present is the worst of times for the vivisection industry. And while an informed, aroused, tax-paying public is already opposing vivisection as usual, it is the next generation that promises to be the real revolutionaries. According to the 1991 Gallup Youth Survey, two out of every three American teenagers support the goals of the animal rights movement.

As for the value of animal model research, the public is smart enough to recognize special-interest PR when they

see it. The plain fact is that since 1900, improvements in human health and longevity owe precious little to the multi-billion-dollar vivisection industry. Only a small fraction of the decline in mortality can be attributed to advances stemming from biomedical research.

TOM REGAN
Professor of Philosophy
North Carolina State University
Raleigh, N.C.

IDEALIZING EUROPE

In "All Work and No Play . . ." (*Letters, TR January 1992*), Tibor Scitovsky offers the myth that Europeans are "more skilled" at enjoying leisure than Americans. Therefore they have more leisure time and use it more productively. To me this sounds like just one more claim about the superiority of non-U.S. culture and learning.

I've lived in Europe for 18 years, and as I read the newspapers, listen to discussions on radio and TV, and talk with friends, it becomes clear that the average European has no greater command of math or world geography than the average U.S. citizen. In fact, it's more accurate to say they both lack the basics. For example, I've listened while an associate tried to convince his British-educated secretary that she didn't need her calculator for multiplication by 100. And in one of the funniest TV programs I've ever watched, a French reporter asked passers-by in Paris, "Where is Seoul?" without getting the correct answer. (This was after the Seoul Olympic games had been on TV for a week!)

Separate from the extended vacations that the generally socialist governments in Europe have legislated, free time on evenings and weekends is as short here as it is in the United States. An added problem is that Sunday shopping (and sometimes even Saturday-afternoon shopping) is banned, so that Saturday-morning scurrying to stores and markets is common. Also, I can see little difference between Europe and the United States in the "productive" use of leisure

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The Apple Macintosh Quadra.

enough to handle the rendering, animating, design and analysis jobs that often require a workstation.

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*Comparisons are based on a 1991 independent research study conducted by Ingram Laboratories that tested a variety of personal computers running applications available for both the Macintosh and Microsoft Windows 3.0 environments. **24-bit video support for up to a 16" monitor. Specifications and descriptions were supplied by the respective vendor or supplier. Orbiter images created by Jerry Flynn. ©1992 Apple Computer, Inc. Apple, the Apple logo, A/UX, Mac, Macintosh and "The power to be your best" are registered trademarks and Macintosh Quadra and SuperDrive are trademarks of Apple Computer, Inc. MicroStation is a registered trademark of Bentley Systems Inc. MS-DOS is a registered trademark and Windows is a trademark of Microsoft Corp. Motorola is a registered trademark of Motorola Corp. NuBus is a trademark of Texas Instruments.

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MIT Reporter

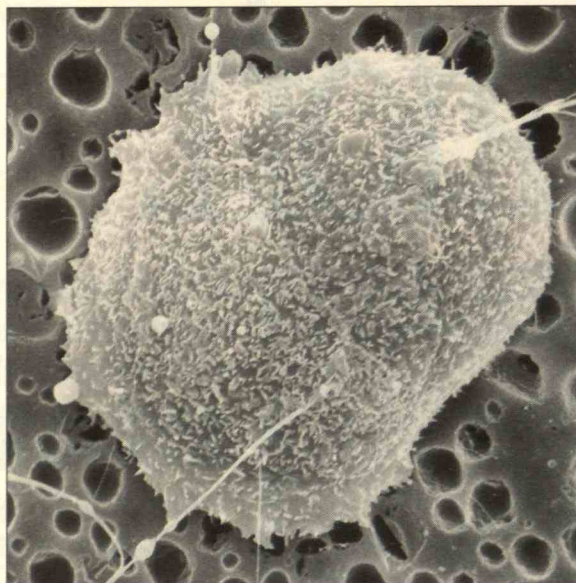
CELLS INTO ORGANS

 Limited by an acute shortage of donor organs, surgeons performed only 2,656 liver transplants in 1990, while 10 times as many people died of liver disease. The lives of such patients may instead be extended someday by new liver cells, implanted on scaffolds of biodegradable polymers, that regenerate into masses and take over at least some of the liver's functions. After years of experimenting with such polymer matrices in rodents, Linda Cima of MIT and colleagues from the Surgical Research Laboratory at Harvard Medical School and Boston's Children's Hospital expect that clinical trials in human patients may be possible in the not-too-distant future.

The team has already shown that liver cells on a matrix can survive and function in rats six months to a year after transplantation. Cima, an assistant professor of chemical engineering and health sciences technology, and Harvard surgeon Joseph Vacanti now hope to test their technique on pigs, increasing the implant size and the number of liver cells to a scale close to that needed for a human child.

Cima, who also holds the Henry L. Doherty Assistant Professorship in Ocean Utilization (she separately conducts research on polymers derived from seaweed), has been fashioning matrices approved for clinical use by the Food and Drug Administration. The body can break down such polymers into water, carbon dioxide, and other components excreted in urine. The first matrix was simply fringe from the unraveled end of braided polyester used for surgical stitches. Then the team tried a polymer "felt" sheet whose thinness makes easy entry of nutrients possible. Cima's group now uses a polymer sponge, which encourages capillaries from the body to grow into the implant and nourish the transplanted cells.

Cima is synthesizing other polymers



Top: MIT assistant professor Linda Cima and her colleagues have grown healthy liver cells on polymer sheets before making transplantation devices of similar materials. Implanted in rats, the devices have taken over at least some of the liver's functions for up to a year. Above: Cima places a suspension of liver cells on a polymer matrix using a pipette.

and working on the matrix's molecular design to improve the survival of implanted cells. In the team's earliest experiments with transplanted liver cells, 90 percent died within 10 hours. The researchers have since succeeded in getting more than 50 percent of the cells to survive a week, with some lasting for months, by injecting them through

catheters onto already-implanted polymer sponges.

In some of these animal trials, too much connective tissue has grown into the matrix and bound tightly to the polymer, forming scar tissue that prevents the liver cells from dispersing throughout the matrix. Cima is now trying to identify pieces of certain proteins or carbohydrates that bind more readily to liver cells than to connective tissue, and she is designing a matrix to be coated with those particles.

The jury remains out on the best way to implant polymer matrices. Cima's fellow researchers consider transplanting the cells directly onto the liver risky, both because the surgery could

cause excessive bleeding and the new cells might become infected with liver disease. The group is therefore implanting the matrix next to the intestines. But Achilles Demetriou, a surgery professor at Vanderbilt University, says he has had poor survival rates of transplanted cells when trying a similar approach.

If the surgical question can be resolved, some patients "might live an extra year with the polymers we've already studied," says Cima. "In the meantime, we'll be working on getting approval for new materials that could have better long-term success."

"Cima is in the very early stages of an area that has tremendous potential," says James M. Anderson, a polymer scientist and pathologist at Case Western Reserve University. "We are heading in the direction of organ substitution."

Recognizing this, some researchers on Cima's team are also studying the use of matrices to transplant cartilage cells. And Cima sees possibilities for a wide variety of applications, including replacement or repair of bone, nerve, skin, intestine, and the esophagus and urinary tracts.

Cima expects the controversy over silicone breast implants to heighten interest in polymer matrices. "Over the past few years there's been a growing interest

in working with resorbable materials," she says. "But now there will be a stampede because of the realization that even the most inert materials [such as silicon] do change in the body and those changes can have harmful effects." She stresses that her method would not apply directly to breast reconstruction after cancer, however, in part because the regeneration of breast cells might trigger the illness's recurrence.

—SUSAN KATZ MILLER

PRESS 1 FOR CASSEROLE



Many people just see red when confronted by computerized telephone services with anonymous voices issuing impersonal instructions, but Paul Resnick sees the potential for quick and efficient electronic bulletin boards. After all, he says, "telephones are the most common and best networked computer terminals."

Resnick, a graduate student in electrical engineering and computer science who is working at MIT's Center for Coordination Science, and Robert A. Virzi, a psychologist at GTE Laboratories, have developed a computerized phone-service technique that could be used by everyone from neighbors wanting to arrange a potluck meal without numerous calls back and forth to companies wanting to track the progress of numerous projects simultaneously.

According to Resnick, the technique, called "skip and scan," is novel in its use of the telephone for collecting and sharing large amounts of information without making users sift through lengthy recorded messages. Resnick and Virzi employ skip-and-scan design rules in HyperVoice, "voice-processing" software that Resnick developed separately and that is named for its similarity to "hypertext," which enables users to jump to particular places in computerized information.

As with other telephone voice-processing techniques, the skip-and-scan method begins by instructing callers to push certain touch-tone buttons for different kinds of information. But it also



tells them what buttons to use if they want to skip particular entries or portions of an entry, or to listen again to whole or partial entries. Callers can also press certain buttons to put messages into the database. While some voice-processing systems let people fast-forward and reverse as they would with audiotape, skip and scan works like a CD player, jumping to the precise place of interest, says Resnick. And because specific buttons are dedicated to forwarding or retreating, people familiar with the system can skip the related recorded-voice prompts.

Skip and scan is already being used on the Boston Peace and Justice Events Hotline. Since 1991, callers have been able to quickly listen to announcements or record their own, using prompts that tell them when to state an event's date, time, sponsor, and other information. Resnick has also developed a skip-and-scan application that allows a group of Pittsburgh teachers to listen to lesson plans and record questions or comments. And he has used skip and scan to create a new opinion forum at MIT.

Resnick and Virzi have found that skip-and-scan users, because they can get access to information faster, prefer the method over other voice-processing systems. Still, Resnick acknowledges that skip and scan will not convert hardcore technophobes into fans of voice-processing systems. Instead, he's focusing on the people who aren't "in love with the technology, they just want to do useful things with it." The goal, he says, is to make it easy for them.

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Trends

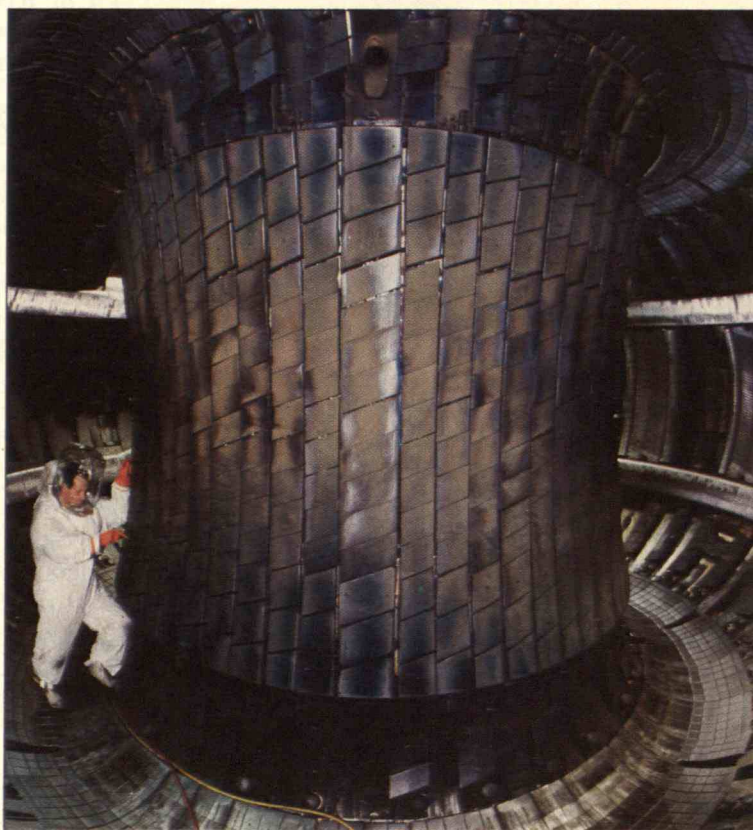
Quest for Fusion

For half a century the allure of nuclear fusion as a clean, inexhaustible energy source has held strong. But harnessing the power of the stars has proven an elusive and frustrating task. Now researchers have their sights on a machine that they believe can finally prove to scientists—and the political world alike—that fusion indeed will be a practical energy source that can ease the world's dependence on coal and oil.

The International Thermonuclear Experimental Reactor, or ITER, program will bring scientists from around the globe to the University of California at San Diego (UCSD) this summer to begin engineering a reactor that is expected to achieve two milestones in fusion. Scientists believe that it will not only reach the "break-even point," at which a reactor produces more energy than it requires, but that it also will attain the "ignition point," at which the fusion reaction sustains itself in what scientists call a burning plasma—the same phenomenon that produces the awesome power of the sun.

With \$1.2 billion committed from the ITER partner nations—the United States, Japan, Russia, and several European countries—the program is emerging as the premier effort in fusion research. It is also the one that could make or break fusion for the foreseeable future. "If ITER fails, fusion will be delayed half a century—or more," says Paul-Henri Rebut, director of ITER and of the fusion research at the Joint European Torus, or JET, facility in Oxford, England.

Ambitious though the program is,



Rebut is confident that the machine can achieve its goals. While the scientists and engineers will explore the most advanced technologies available for the reactor's design, Rebut says that he intends to choose only those that can be proven reliable and that will work together.

The reactor, in fact, will be an extrapolation of conventional tokamak design, which uses strong magnetic fields to confine atomic nuclei inside a torus-shaped chamber. The nuclei are then heated and shaped with electric current, particle beams, and microwave beams to hundreds of millions of degrees until they fuse in a burst of energy.

The new design will offer several advantages over existing reactor designs, however. Most significantly, ITER's torus-shaped reactor chamber, which will measure 40 feet in diameter, will be twice the diameter of the JET reactor, now the largest in the world. Because the chamber is larger, it will take longer for

the heat in the plasma to "leak out" to the vessel walls. And the longer the heat can be contained in the plasma, the greater the chances of achieving both the ignition and break-even points. Also, the fuel used in the new reactor will be a combination of tritium and deuterium, which burns more cleanly and efficiently than deuterium alone, which is used in existing tokamaks.

The new reactor is expected to run in a "steady state" for two weeks or longer, compared with runs of several seconds in tokamaks in use now, according to Rebut. And, if successful, the design should be the core of a future generation of power reactors.

But success for ITER is not assured, as a number

of important technical hurdles remain. For example, scientists must find better materials to withstand the bombardment of neutrons produced during fusion reactions. The stainless steel used in the vessel walls presents a major problem because it absorbs radiation and becomes fatigued over time, says Ronald R. Parker, director of the Plasma Fusion Center at MIT and a deputy director of ITER. Parker will be working with materials scientists in Germany to develop more resistant carbon-based materials for the vessel walls.

Another critical challenge will be to find a suitable material for the diverter, a ring-shaped trough at the top and bottom of the vessel that strips impurities from the plasma as it whizzes around the chamber. Because it must be able to withstand the intense heat as the plasma brushes past, "the diverter's the principal limitation on the performance of the machine," said Alexander Glass, associate director of Lawrence Livermore

National Laboratory and leader of the American team to ITER. Scientists doubt whether existing carbon composite materials or even tungsten can withstand the heat during extended reactor runs.

It will also be essential to design new superconducting magnets to handle most of the work of compressing the plasma. Such magnets, which have been used successfully on a smaller scale in current tokamak models, will be vital in reducing electrical power consumption so that the reactor can operate at break-even efficiency. The challenge will be to position the magnets near enough to the vessel to produce the most powerful magnetic fields possible, yet shield them from the heat produced by the fusion reaction to keep them from overheating and shutting down.

Finally, the researchers will also search for ways to increase the density of the swirling plasma to improve the chances of achieving a sustainable fusion reaction. One avenue involves using high-intensity microwaves to replace particle beams for compressing the plasma. Though not as refined as particle-beam technology, techniques for producing microwaves and introducing them into the plasma could prove a less expensive and more efficient alternative.

UCSD's Marshall Rosenbluth, chief scientist for the U.S. contingent to ITER, says it is also critical that fusion meet environmental as well as technical expectations if fusion power reactors are

to be built. Nuclear fission, which splits atoms to release energy, has encountered stringent opposition because it produces toxic wastes and because of the risk of reactor meltdown, which would release radioactive material into the atmosphere.

Fusion is intrinsically safer because a malfunction would cause the plasma to cool and the reaction to cease. ITER's only radioactive waste is the stainless steel chamber, which must now be buried when a reactor goes out of service. But the hope is that the carbon or silicon-based materials of the future could absorb neutrons without being transformed into a radioactive isotope.

Despite the technical challenges ahead, Rebut remains optimistic. He believes that construction of a break-even fusion reactor could begin before the end of the decade, with experiments getting under way by 2005. The first commercial reactor, a descendant of ITER, could conceivably be built before 2030, he says.

Toward those ends, Rebut wants to have a draft of the ITER plan circulating among policymakers within two years to build support and avoid delays. Scientists and political leaders alike must have enough confidence in the technology, he says, to commit the estimated \$6 billion required to erect the reactor.

—DAVID GRAHAM (*The author is a science reporter for the San Diego Union-Tribune.*)

Pests with Redeeming Values

It has all the makings of a sci-fi thriller: a transatlantic freighter picks up its cargo at a Black Sea port, where an alien invader slips aboard unseen. When the freighter reaches its final destination, the alien escapes and produces countless offspring that wreak havoc on the local populace.

The scenario is not complete fiction. In fact, scientists think it probably describes the origin of the zebra mussel invasion, now sweeping across the Great Lakes region and down into the Mississippi River and other inland river systems.

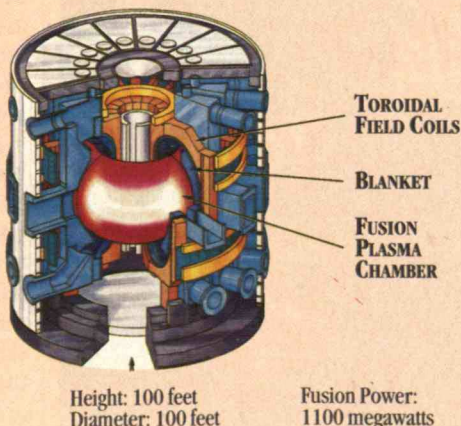
Zebra mussels first made their presence known in North America in the late 1980s, when they began to clog the water intake pipes of industries on the Great Lakes. Because the small brown-and-black striped bivalves sift microscopic algae and other nutrients from flowing water, attaching themselves to the inside of an intake pipe was like moving into a banquet hall.

Since then, zebra mussels have reportedly been fouling up everything from the cooling systems of nuclear power plants to the engines of power boats. In December 1989, for example, they forced a shutdown of the sole drinking-water treatment plant in Monroe, Mich., on Lake Erie. Mussels overgrowing the intake pipe disrupted the flow of water, causing ice to form and eventually choke off the water supply. Drastic water-conservation measures then kept industries, schools, and local businesses at a two-day standstill.

The problem has become so widespread that industries and utilities along the Great Lakes estimate that unclogging mussel-packed pipes in the region will cost up to \$4 billion over the next 10 years.

More than an expensive nuisance, however, zebra mussels present a threat to freshwater ecosystems. For instance, the mussels outgrow the native clams species—about a dozen of which are listed as endangered—by 10 to 20 times, says

The International Thermonuclear Experimental Reactor—the scientific community's make-or-break effort to prove that fusion is practical—will contain a 40-foot-diameter plasma chamber, twice as wide as that of the Joint European Torus (left), now the world's largest. Other critical innovations include powerful superconducting magnets to confine the plasma and a neutron-shielding blanket to protect the magnets from overheating and shutting down.



David Garton, a zoologist at Ohio State University. Because the clams have difficulty competing for food under such conditions, they eventually starve to death. In fact, scientists have already documented an almost complete loss of clam populations on the western side of Lake Erie and in Lake St. Clair, a small lake sandwiched between lakes Erie and Huron.

In the Mississippi River system, damage to clam populations could also have serious economic consequences. Native bivalves there are the basis for a multi-million dollar cultured pearl industry.

Not surprisingly, researchers are seeking ways to thin the ranks of the zebra mussels. One option—having underwater divers scrape them off of intake pipes and other areas—is time-consuming, expensive, dangerous, and merely temporary, as the mussels quickly recolonize any bare surfaces.

A second option is poison. The town of Monroe favors chlorine, the most widely used “molluskicide,” to keep its intake pipe clear. But chlorine kills other species and forms carcinogenic trihalomethanes, says Ohio State University toxicologist Susan Fisher. Chlorine use, therefore, is generally limited to closed spaces such as interior pipes.

A potentially less dangerous control agent under consideration is potassium chloride. Fisher has found that potassium ions are highly toxic to zebra mussels. At two sites on Lake Erie this summer she will conduct field tests with the compound, targeting microscopic zebra mussel larvae, which float around in the water before they attach to hard surfaces. “With potassium, it might be enough just to irritate the larvae to prevent them from settling,” she says. Low levels of potassium could be continuously released to keep pipes from clogging.

Zoologist Garton is less concerned with killing zebra mussels outright than in understanding what makes them so prolific. Garton and Jeffrey Ram, a reproductive physiologist at Wayne State University in Detroit, are exploring “birth control for mussels.” One possibility, says Ram, is to stimulate spawning out of season, when there is much less



Stowaways from Europe, zebra mussels have few natural predators in the Great Lakes and the Mississippi River system. They are rapidly multiplying and clogging industrial water-intake pipes and valves, such as those at the Monroe Power Plant (above and below) on Lake Erie. Researchers are beginning to devise promising population-control techniques, and they hope to take advantage of the mollusks' enormous algae-filtering capacity to help clean up eutrophic lakes.



food available for zebra mussel larvae. Studies indicate that chemicals produced by phytoplankton—the microscopic algae on which zebra mussels feed—trigger the release of sperm and eggs. “Males are probably stimulated first,” explains Ram. “Some males then stimulate females and vice-versa. It’s like a chain reaction.” Ram wants to identify the chemical sequence in this chain reaction in order to induce premature spawning.

For all the damage they do, zebra mussels have some redeeming qualities. In the Netherlands, for instance, they are being introduced into a few eutrophic lakes on a trial basis to clear up heavy algal growth. The voracious feeders can each filter microscopic algae from up to one liter of water a day. These native mussel populations are kept in check naturally by predatory fish and diving ducks, whereas only one or two species of Great Lakes fish are able to break the mussel shells and indigenous ducks are too few in number to have a significant impact.

The Dutch and Germans have also been experimenting with zebra mussels as biofilters. Bags of mussels suspended in the effluent streams of chemical plants have been found to significantly improve water quality. However, the polluted mussels must then be buried in a landfill or incinerated as hazardous wastes.

Finally, the mollusks are being employed as an early warning system to detect excess pollutants at some European plants, says Garton. By attaching electrodes to the shells of a small number of animals, researchers have set up an alarm system that is triggered when the mussels close their shells in the presence of certain pollutants, thereby completing an electric circuit.

The U.S. invasion also has a few bright spots. The mollusks have helped clear up algal pollution in some areas of Lake Erie, allowing for faster growth of deep-water plants and of the snails, crayfish, amphipods, and fish that feed on them. “There’s no doubt that zebra mussels have caused changes in aquatic communities,” says Garton. “Some are negative and some are positive. It’s a mixed blessing.” —TRACEY COHEN

Circumcision Circumspection

Just when it seemed that public opinion was about to catch up with modern medical views denouncing routine circumcision of newborns, along comes a new round of research to stir up controversy once again. Since the 1970s, when the American Academy of Pediatrics (AAP) twice discounted the procedure—*de rigueur* for newborns in the United States since the 1940s—circumcision has gone out of favor. In fact, according to the National Center for Health Care Statistics, circumcision rates dropped dramatically during the 1980s, from 85 to 58 percent.

But now, according to Edgar Schoen, clinical professor of pediatrics at the University of California at San Francisco Medical School and former chairman of the AAP's task force on circumcision, "the evidence is getting to be, medically speaking, more and more in favor of circumcision." In a 1990 article for the *New England Journal of Medicine*, Schoen extolled the benefits of routine circumcision. Since then, he says, even more compelling medical evidence for the procedure has come to light.

For example, doctors have long suspected that circumcision helps prevent urinary tract infections. "Now it's no longer a maybe," Schoen says, "but a positive." Recent studies have shown that uncircumcised infants experience 10 to 20 times more urinary tract infections than circumcised babies do during their first year of life; the mucous membranes of the foreskin act as a magnet for the uropathic bacteria that cause urinary tract infections. These early months are critical: if a urinary tract infection involves the kidney, it can predispose the infant to kidney infections later in life.

In addition to renal problems, uncircumcised males face a higher risk of cancer of the penis. Although doctors admit that this cancer is rare (only about 1,000 cases are reported in the United States each year), it is 5,000 times more com-



Precaution or mutilation? Contradictory claims from the medical community have revived the controversy surrounding the age-old practice of circumcision.

mon in uncircumcised men, according to Schoen. "Essentially, cancer of the penis is a disease of the uncircumcised man," he says. "Universal circumcision would eliminate this cancer."

Yet, while some in the established medical community may be changing their position on circumcision, others aren't necessarily following suit. An anti-circumcision contingent, which includes doctors as well as advocacy and support groups such as UNCIRC (Uncircumcising Information Resource Center), insists that the procedure is not medically necessary. "It's a massive epidemic of unnecessary surgery," says George Denniston, a preventive-medicine specialist in Seattle and former associate medical director of the Planned Parenthood Federation of America.

Denniston says that even if the latest medical studies are correct, the risks to the uncircumcised are too small to cause concern. Take urinary tract infections. Even if they occur in 1 out of 100 for uncircumcised males—a rate that Denniston claims is excessive—then the country is circumcising 100 babies to prevent just 1 infection that is completely treatable with antibiotics. Cancer of the penis is even more rare, he says, suggesting that complications, even death, resulting from infant circumcision are a greater risk.

If there are no good reasons for

"amputating" the foreskin, as Denniston puts it, he has plenty of reasons for leaving it in place. "The foreskin is the most sensitive part of the penis, the seat of sexual pleasure. It has the nerve endings that do the job."

So great is the difference in sensation provided by the foreskin that some circumcised men are even trying to restore what was surgically removed. In fact, foreskin restoration was addressed in

two books published this spring, *Say No to Circumcision!* by Thomas Ritter and *The Joy of Uncircumcising!* by Jim Bigelow, a psychologist who heads San Francisco-based UNCIRC.

"Our stereotype is that men don't care," says Bigelow, who sees men concerned about circumcision in his therapy practice. "But men do care that their bodies have been mutilated." Though circumcised men can never recreate the foreskin they had at birth, they can stretch the remaining skin into a reasonable working facsimile using nonallergenic tape and devices such as weights, foam cones, and steel ball bearings, says Bigelow, who has followed the progress of hundreds of men undergoing restoration.

"Some men can't tolerate certain devices, and for some the process may take years," Bigelow admits. "But all human skin is expandable, and I haven't found anyone who couldn't do it." Surgical reconstruction through a skin graft is also a possibility, he says.

Schoen and other doctors dismiss efforts by these so-called "foreskin fundamentalists." There is no proven difference in sexual pleasure between circumcised and uncircumcised men, says Schoen, and calling circumcision akin to amputation is simply overstating the matter. "That's like saying you're amputating your finger when you cut your nails."

Nevertheless, though Schoen believes that the pendulum will swing back toward circumcision, the AAP has not changed its formal position denouncing the procedure.

—DEBRA ROSENBERG (*The author is a reporter for Newsweek.*)

A Keep-Out Sign for the Ages

As the U.S. Department of Energy prepares to store contaminated remains from the nuclear weapons program in underground salt chambers near Carlsbad, N. Mex., it faces a communication problem no society has ever confronted before.

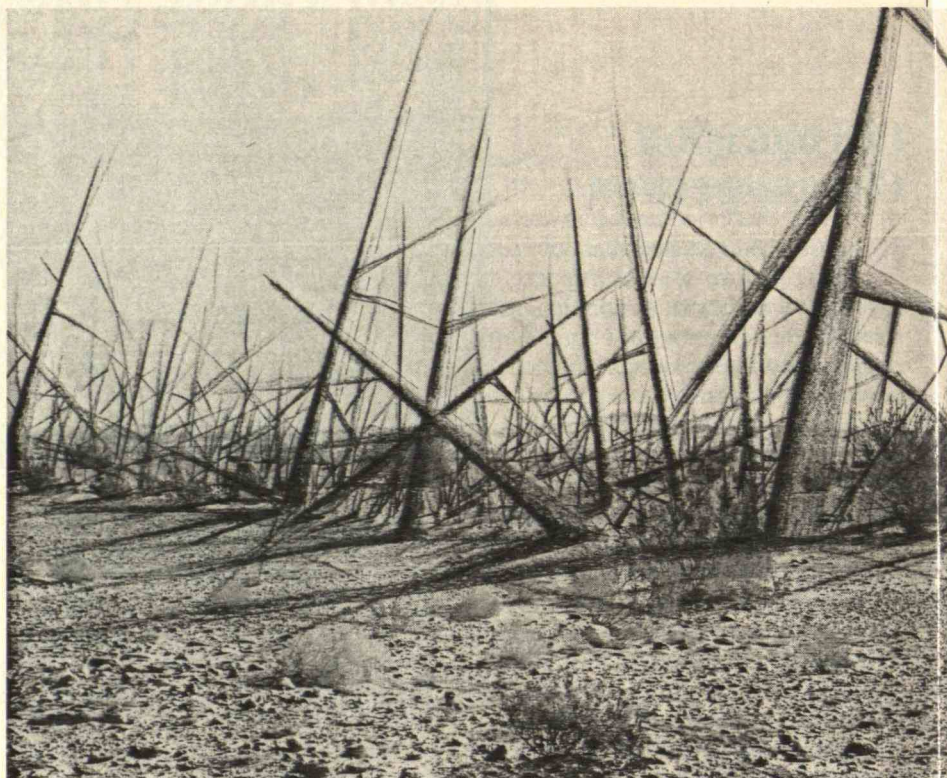
How do you warn people for the next 10,000 years that hidden under the desert is a technological tomb that will loose potentially lethal doses of radiation—a modern version of the curse of the Pharaohs—upon anyone who disturbs it?

How do you communicate a warning over 300 generations when the greatest likelihood is that no language spoken today will still be in existence, and when war or natural calamity may have erased all obvious traces of this era's radioactive waste interment?

Several answers, if not *the* answer, have recently been furnished in a report to Sandia National Labs, which is overseeing the project for the Department of Energy, by a 13-member team of anthropologists, linguists, architects, materials scientists, artists, astronomers, and psychologists engaged in what has been dubbed the Marker Project. Meeting in New Mexico last fall and winter, the team came up with a variety of proposals for a so-called Sign of Ages to warn future generations that steel drums full of highly radioactive tools, gloves, rags, and other common objects have been buried in several miles of chambers some 2,000 feet below the scrub desert of southeastern New Mexico.

Achieving one of the team's first objectives—choosing a durable material for the marker—was relatively easy. "Stones are already in a certain chemical equilibrium with the environment," says team-member Dieter Ast, professor of materials science at Cornell University. But hitting on something that would survive 10,000 years of human predation was quite another matter.

"If you go back into ancient history



you find that one of the first things new regimes do is tear down the monuments of their predecessors," says team-member David Givens, director of information services for the American Anthropology Society. "And this doesn't take into account the casual vandalism that people always indulge in." In fact, one of the biggest fears was that if the marker were too interesting, it would become an objet d'art, that predatory collectors would steal, as they have always done over the ages.

To circumvent vandalism, the team suggested a variety of defensive strategies. First, they proposed that any above-ground marker should be made out of the commonest and least valuable material possible. Granite was a popular choice as was concrete and compressed earth. Moreover, the stones should be huge—six tons or more—and carved in irregular fashion so they couldn't easily be used to construct something else.


Besides the main marker, the team suggested seeding a million or so small objects with warnings written on them—pieces of glass, perhaps—throughout the site. The group reasoned that even if the large marker were car-

A "landscape of repulsion"—a mile-square thicket of concrete thorns—is one proposal for warning future generations to steer clear of New Mexico's radioactive burial ground.

ried off, vandals would not make off with all of the smaller signs.

Deciding on the actual language for the marker—perhaps the most formidable challenge—proved to be one of the least controversial aspects of the project. In addition to recommending that warnings be posted in a variety of existing languages, the group agreed that pictographs of one sort or another should be engraved on the marker, since most languages become extinct after about 1,500 years. "I looked at art over the last 5,000 years to see what was universal," says Jon Lomberg, an artist who specializes in scientific communication. "What I came up with over and over again was the pictorial narrative, a kind of comic strip.

Since today's warning symbols—the skull and cross-bones, the radiation trefoil—may not be precisely understood by future generations, the group proposed that a symbolic "alphabet" be



included in the warning markers. "You would create a comic strip showing what the skull and crossbones meant, and then you would use the symbol in the rest of the message," says Lomberg.

Others on the Market Project wanted to go beyond the comic-strip approach. Astronomer Frank Drake of the University of California at Santa Cruz—chosen to participate in the project in part because he helped design the *Pioneer* spacecraft plaque intended to introduce humans to alien beings—suggested that while individual languages may disappear, the periodic table of elements might endure. He proposed that a

table highlighting the isotopes of the radioactive substances buried underground be reproduced on the marker.

And Michael Brill, an architect from Buffalo, believed that by tapping into deeply held psychological archetypes designers could create a place that people would instinctively avoid no matter what their culture or language. "My idea is to design the entire site as a landscape of repulsion, a place of dangerous emanations and wounds to the body," he says.

Brill proposed several possible constructions—a landscape of thorn-like stones, a giant rubble pile, or a huge, black basalt slab dubbed "the black hole"—that he suggested would look both uninhabitable and unfarmable."

But Lomberg, for one, favors simplicity over repulsion. He argues that making anything too unusual is dangerous because "instead of viewing the marker as a warning, people in the future would see what they thought was great art. You want to say that this is dangerous as simply as you can."

—STEPHEN STRAUSS (*The author is a science reporter for the Toronto Globe and Mail.*)

The Chinese Biotech Connection

For Asian nations seeking to expand their industrial base beyond electronics and computers, biotechnology has an obvious appeal. The field is so young and undeveloped that Western companies have not scooped up all the market niches. It depends more on a strong supply of scientists than on capital. And it promises some solutions to specifically Asian problems—such as treating local diseases, increasing food supply, and reducing pollution—that are unlikely to attract the attention of Western companies.

Not surprisingly, East Asian governments are working hard to promote biotechnology. Japan already has a small biotechnology industry, which leads the world in such areas as fermentation technology. Singapore has established the Institute of Molecular Biology to undertake basic research in biotechnology. And the Taiwanese government has poured millions of dollars into the field.

But the most likely breeding ground for a strong Asian biotech industry is mainland China, aided and abetted by Hong Kong. "China offers more of an opportunity to develop biotechnology products than anywhere else in the world, including the United States," asserts Dominic Lam, a scientist-entrepreneur based in Houston, who has spent much of the past four years in his home town of Hong Kong as founding director of a nonprofit institution called the Hong Kong Institute of Biotechnology (HKIB).

One reason for such optimism is the large number of first-rate biologists produced by China, who are eager to work for salaries that are low even when compared with those in other Asian countries. These scientists also seem less vulnerable than other university graduates to changes in China's political climate. "To a large extent, the good people in biotechnology move up," says Lam, "and China has a fairly decent peer-review system."

In addition, China has a wealth of natural resources, such as herbs, that have become the basis of traditional Chinese medicine. With appropriate genetic manipulation, many of these substances could provide solutions to medical and economic problems endemic to the Third World.

All China needs, says Lam, is the business know-how to commercialize its biotechnology. And Hong Kong, Asia's capital of unrepentant capitalism and the gateway to China for decades, fills that bill. The idea, Lam explains, is to use Chinese intellectual power to come up with the ideas and Hong Kong labor to make the final products—the reverse of the two economies' normal business arrangements, which rely on Chinese brawn and Hong Kong brains.

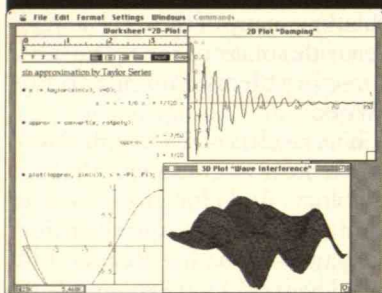
Several biotechnologists from China are already working at HKIB, which moved into its permanent quarters in late February. According to Charles Kao, vice-chancellor of the Chinese University of Hong Kong and the person who dreamed up the idea of HKIB, the institution has signed agreements with several mainland research institutes, including the Shanghai branch of the Chinese Academy of Sciences, the Yunnan Provincial Commission of Science

By combining China's considerable technical and biological resources with Hong Kong's renowned entrepreneurial skills, Dominic Lam, founder of the Hong Kong Institute of Biotechnology, hopes to help China become a world leader in biotechnology.



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and Technology, and the National Center for Biotechnology Development.

Entities from the West can also get involved. For example, HKIB has established a joint venture with the California-based pharmaceutical company Syntex. Under the terms of the agreement, researchers in HKIB's laboratories and Syntex's labs in Palo Alto are screening natural and synthetic products—provided by the Chinese Academy of Sciences—for pharmaceutical potential.

Pharmaceutical scientists have some precedent for their hopes. Within the past two years, two substances used in Chinese medicine have shown pharmaceutical promise in Western contexts. An agent called ginghamosu, derived from a Chinese shrub, was identified as a potential antimalarial drug; clinical trials on the agent started last year in the United States and Holland. And a substance known as compound Q, extracted from an inedible cucumber and used by Chinese practitioners to induce abortions, showed some promise in destroying cells similar to those that spread AIDS through the body. The compound had a brief spurt of popularity as an alternative AIDS treatment, but turned out to have toxic side-effects. Researchers hope to modify the compound to reduce toxicity while maintaining the healing potential.

But many Asian scientists believe that the region's real opportunities in biotechnology involve solutions to regional problems, such as hepatitis B and cholera, that Western research has not addressed. For example, although China has a license from the pharmaceutical company Merck for a vaccine against hepatitis B, the vaccine costs \$30 per dose. At that price, the government can't possibly afford to treat a patient population of some 250 million people.

The challenge here is not so much to create less expensive preparations as it is to develop a cheaper way of getting existing vaccines into people. Classic injections are fine for the West, but they require a prohibitively costly infrastructure for a developing nation such as China. Thus, some researchers are using

biotechnology to develop cheaper delivery systems. In fact, Life Tech Asia Ltd.—a Hong Kong company with Chinese connections—has applied for a patent on a technique it has developed to introduce vaccines into animal milk, which patients then consume.

The search for new pharmaceuticals and delivery systems may herald only the beginning of an Asian biotechnology industry. In fact, attacking local agricultural and environmental problems may provide even greater opportunities. "In China, there are about 800 million people directly or indirectly associated with agriculture," explains Kenneth Lai, president of AgriStar (Asia) Ltd., a Hong Kong company recently set up by Lam to commercialize a high-production cloning technique for accelerating the reproduction cycles, and hence the varieties, of plant species.

Called micropropagation, this method prevents contamination of the cloned plants—the major shortcoming of current test-tube cloning methods—by using a high-density polyethylene membrane to maintain sterile conditions in each chamber in which a plant is growing. The patented technique will be applied to try to improve the quality and production of some of China's major crops.

One successful attack on the local environmental front stems from the recent discovery by a biochemist at the Chinese University of Hong Kong of a bacterium that breaks down indigo dye—a pollutant from the garment trade that seriously discolors local waterways. HKIB is now in the process of adapting the organism for environmental use and plans to market the result in the region.

"Because China is an agricultural society and is increasingly concerned with health issues, the domestic market for biotechnology-driven products that address these local needs is immense," says Lam. In addition, he notes, because China can provide first-rate technical support in biotechnology at a low cost, it has the potential for satisfying a large export market as well.

—PETER GWYNNE

Fighting the Plague

An Interview with Mathilde Krim

FORTY million people; the number is a little more than the combined population of the 47 largest U.S. cities. It's also how many people the World Health Organization estimates could carry the AIDS virus, or HIV, eight years from now. Today, between 9 and 12 million people are infected, and, according to the Centers for Disease Control, 1 million of them live in the United States.

Beyond the suffering inflicted on AIDS victims themselves, as well as their families and friends, everyone will share the disease's rising cost. The price tag for treating infected Americans is rising by 21 percent a year, and now accounts for almost 1 percent of all the money spent in the United States on health care.

Long before such figures were available, Mathilde Krim declared an all-out war on AIDS. Krim learned of the disease in 1980 through her work at the time as head of the interferon lab at the Memorial Sloan-Kettering Cancer Center in New York. In 1983, she founded the AIDS Medical Foundation with more than \$100,000 of family funds, and started raising additional money. She then began parceling out funds as research grants.

In 1985, the AIDS Medical Foundation merged with a similar West Coast organization to become the American Founda-



tion for AIDS Research. AmFAR has now given out more than \$43 million while making the AIDS war a cause célèbre, with actress Elizabeth Taylor topping a list of famous people who contribute time and money. (Krim's personal life has played a role in this regard: she and her husband, Arthur, former chair of Orion Pictures, have long traveled in political and celebrity circles.)

AmFAR has devoted some of its funds to education and lobbying. For example, the organization has published treatment directories for physicians—publications that Martin Hirsch, director of AIDS research at Massachuset-

General Hospital and professor of medicine at Harvard University, says have been some of the few sources available on clinical research. The organization has played a role in policy battles ranging from condom distribution in schools to the legal entry of HIV-infected people into the United States. Early on, AmFAR came out in favor of (and was the first to finance research in) needle-exchange programs. And it successfully lobbied Congress to pass a bill on health-care services for people with AIDS, the so-called Ryan White Act.

But AmFAR funnels most of its money into scientific work. These funds are minuscule compared with those dispensed

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by the National Institutes of Health (NIH), but Hirsch calls AmFAR's research effort "extraordinarily important" because it provides short-term financing to scientists with new ideas not yet ready to attract federal money. Overall, Krim says, biomedical researchers supported by AmFAR have gone on to obtain \$27 in public or industry funds for each dollar invested by the private organization.

AmFAR also spearheaded the development of a nationwide system of 45 "community-based clinical research trial" centers organized to serve patients who might not enter other research programs. And the organization and NIH's National Institute of Allergy and Infectious Diseases have joined forces to sponsor the creation of the largest database on HIV disease yet, so far tracking more than 5,000 people.

An adjunct professor of public health and management at Columbia University, Krim involves herself in AIDS issues ranging from the local level (she advises New York City Mayor David Dinkins) to the international level. Speaking at the U.N.'s 1990 World AIDS Day Conference, for instance, she called upon affluent nations to accept their "special responsibilities" and share "knowledge as well as financial and technical resources" with developing countries in the fight against the epidemic.

In a recent interview with *TR* senior editor Laura van Dam, Krim talked about AIDS research, education, and public policy.

To advance research and education concerning HIV and help infected individuals, Mathilde Krim has worked with prominent people such as Elizabeth Taylor, Liza Minnelli, Madonna, and (bottom photo, left to right) artist David Hockney, Walt Disney chair Michael Eisner, and his wife Susan.

TR: You've predicted that there will be an enormous rise in the number of AIDS cases over the next five years. Why do you say that?

KRIM: Because so many people became infected with HIV between 1975 and 1985, and because scientists now think the disease's incubation period is typically 11 years or so.

What enrages me is that we had evidence in 1982 of what we were dealing with, a disease transmitted through sexual relations and blood. From that time, we could have said "watch out"—but we didn't. In fact, the first federal pamphlet on AIDS, written by then-Surgeon General C. Everett Koop, was issued in 1986. And you could obtain that pamphlet only by requesting it: there was no budget for distribution.

And AIDS will no longer be confined largely to groups such as gay men. For example, women now account for one of every eight people with AIDS. Among infected, asymptomatic people, there are two women for every five men. And contrary to what some people would like to believe, infected women can also transmit the disease. Although that transmission route is a little less efficient than from men to women, an infected woman will likely transmit the virus after a number of encounters with one partner.

TR: Still, AIDS is far from being the leading killer in the country. Isn't it possible that too much attention could be paid to this disease relative to other deadly illnesses?

KRIM: There is a qualitative difference between AIDS and something like cancer or heart disease, which usually kill people in the last third of their life span. AIDS tends to kill people in their first third or second third. They are old enough for society to have invested in them years of nurturing and education, and young enough for society to miss the contributions of a lifetime. Peter Arno, an economist at the Montefiore Medical Center in New York, and I have calculated that for 1994, AIDS cost this nation \$3.5 billion in medical care but \$55 billion in potential productivity.

Also consider the fact that people with AIDS are sick for up to three years now. Not only is their treatment as expensive as that for cancer, but the cost to the public is high. HIV-infected people are either uninsured and don't have any savings because they are young, or they lose their insurance when they lose their jobs, and quickly become destitute. All this raises the

load on public-assistance systems.

TR: What's needed?

KRIM: First, we have to recognize that education can work. Take the gay community, where the effort to achieve prevention through education started in 1984. Within three years, behavior among the gay population changed drastically. The incidence of infection in San Francisco has dropped from 20 percent per year in 1984 to 1 percent per year now. In dollar terms, an investment in AIDS education is cost-effective. You can educate an awful lot of people with \$100,000, while that money is barely enough to treat one person with AIDS.

To modify sexual behavior, we know that talking down and moralizing doesn't work, but rational arguments from peers do. Also, to change behavior in a group, we have to reach everyone at appropriate times and in appropriate locations where frank talk can take place. For instance, you often find young people at high risk of HIV infection in bars. So these places can be very useful locations for reaching people with educational messages. AmFAR is doing that now, by supporting five local organizations that pass out condoms and information in bars.

TR: But can education reach a point of diminishing returns? For example, we've heard of a recent "relapse" of unsafe sex among some people.

KRIM: I don't like the word "relapse." I believe that we have mostly a new generation of young gay men growing up, some of whom think AIDS is a disease of "old" folks, because they don't see their contemporaries becoming sick. We have to fight that notion.

In another AmFAR project, we have found that a good way to reach women of Caribbean origin is at their hairdressers'. Very often they consult the woman who does their hair on beauty and health tips, and she can explain negotiation strategies they can use so that their boyfriends and husbands will be careful. She can even supply them with condoms.

We have awarded some grants to researchers trying to identify effective ways of preventing the spread of HIV through education in various African countries. Our funds help train AIDS educators and even local medicine men and ministers to be educators. Missionaries are very important in certain areas, and in countries with a one-party sys-

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tem, where the government has a lot of control over everyday life, social workers employed by the government may be the right people to involve.

Prostitutes often infect many men, but they can also be taught to be good educators. One can explain the facts to prostitutes, give them condoms and teach them to also use sponges with spermicide, and send them out to talk with their friends.

New Drugs to Fight HIV

TR: What new drugs for combatting HIV can we expect to see?

KRIM: The major drugs fall into essentially three groups. All impede HIV from using the body's cells to multiply. Some halt a key stage in that process, such as when HIV transforms its genetic material into a form that the cells will "read" to make more HIV particles. Drugs of the first group are called nucleoside analogs, because they are akin to DNA's building blocks, or "nucleosides." A slew of such drugs have been tested in vitro, some have emerged in clinical trials, and two—AZT and DDI—are on the market. However, both AZT and DDI have side effects: to some extent, they also inhibit enzymes important to the cells' proper functioning. As a result, AZT can cause anemia and the white blood cell count to drop, so that a person can take the drug for only one to two years.

Moreover, HIV strains that can resist AZT appear in the body quickly. In fact, because viruses have an uncanny ability to become resistant to single drugs, antiviral therapy should ideally involve a combination of drugs. We need to develop many more antiviral drugs to find the best combinations. And we can try combining nucleoside analogs with, for example, interferon. Interferon, a naturally occurring substance in the body that fights viral infections, has been found to synergize the effect of many antiviral drugs because it has a completely different mechanism of action: it interferes with the late stages of virus particle formation. —

TR: What about the other drugs that are in the works?

KRIM: The second group of drugs, known as benzodiazepin analogs, acts somewhat like nucleoside analogs. But it is chemically different. Although these drugs may be more effec-

tive at suppressing HIV multiplication, researchers have been tremendously disappointed to learn recently that viral resistance to many of them can develop in weeks. Now there is only one company that is studying one of them in combination with AZT.

Drugs in the third group are especially designed to block one of several enzymes encoded by the virus's genes. These enzymes are essential to virus multiplication. Researchers hope that these drugs won't interfere with cellular metabolism and therefore won't be toxic. But the research is very complicated, requiring the ability to create drugs with very particular molecular sizes and shapes. And since you have to make sure that the drug you design can get into the infected cells, some of the compounds will need to be attached to "carrier" molecules.

TR: What's happening on the vaccine front?

KRIM: In the test tube, we may already be well on the way to an adequate vaccine. Researchers have come up with various HIV protein preparations capable of stimulating a complete immune reaction to the virus. Killed whole HIV also appears capable of immunizing against HIV. [See "The New Vaccines," *TR*, January 1992.] Several such preparations are undergoing clinical testing, and large field trials are being planned. But it will take 10 years before we settle on a vaccine that we feel can be safely administered to everyone, including children, and that we know will protect people from HIV infection.

Long-term field trials in humans are needed to test the safety and effectiveness of potential vaccine preparations. HIV infects only people (and chimpanzees, of which there are very few available). And you cannot verify the effectiveness of any vaccination by deliberately challenging vaccinated people with live virus to see whether they will become infected. So for each vaccine field trial you will have to recruit thousands of volunteers living in an area where the risk of infection is high. They will have to be tested for HIV to make sure they are not already infected, they will have to be instructed about the risks they might run in participating in a vaccine trial, and they will have to be taught, for ethical reasons, how to avoid HIV infection.

After that, one group will receive the potential vaccine, the other a placebo. They will then lead their lives for a certain period of time, after which they will be tested for HIV infec-



In 1991 Matilde Krim testified in favor of condom distribution at the New York City Board of Education.

tion. Since all those vaccinated will carry antibody to the vaccine's viral proteins, the researchers will have to use a sophisticated test—which already exists—that can distinguish between the antibody produced in response to the vaccine and the antibody produced in response to naturally acquired infection. Anti-HIV vaccine field trials will therefore be logistically complicated, costly, and time-consuming.

TR: Where do you get people for such a test?

KRIM: If this testing were to be done in the United States, I would favor issuing an appeal for people who are not infected although their sexual partners are. Or you could vaccinate everyone in certain regions of a Third World country such as Zaire or Kenya where the risk of infection is high.

TR: A country could resent the idea of researchers trying to vaccinate its population.

KRIM: That would not be justified, because large vaccine trials could amount to an enormous public service. People would not be harmed. Quite the contrary: they would at least receive free education on

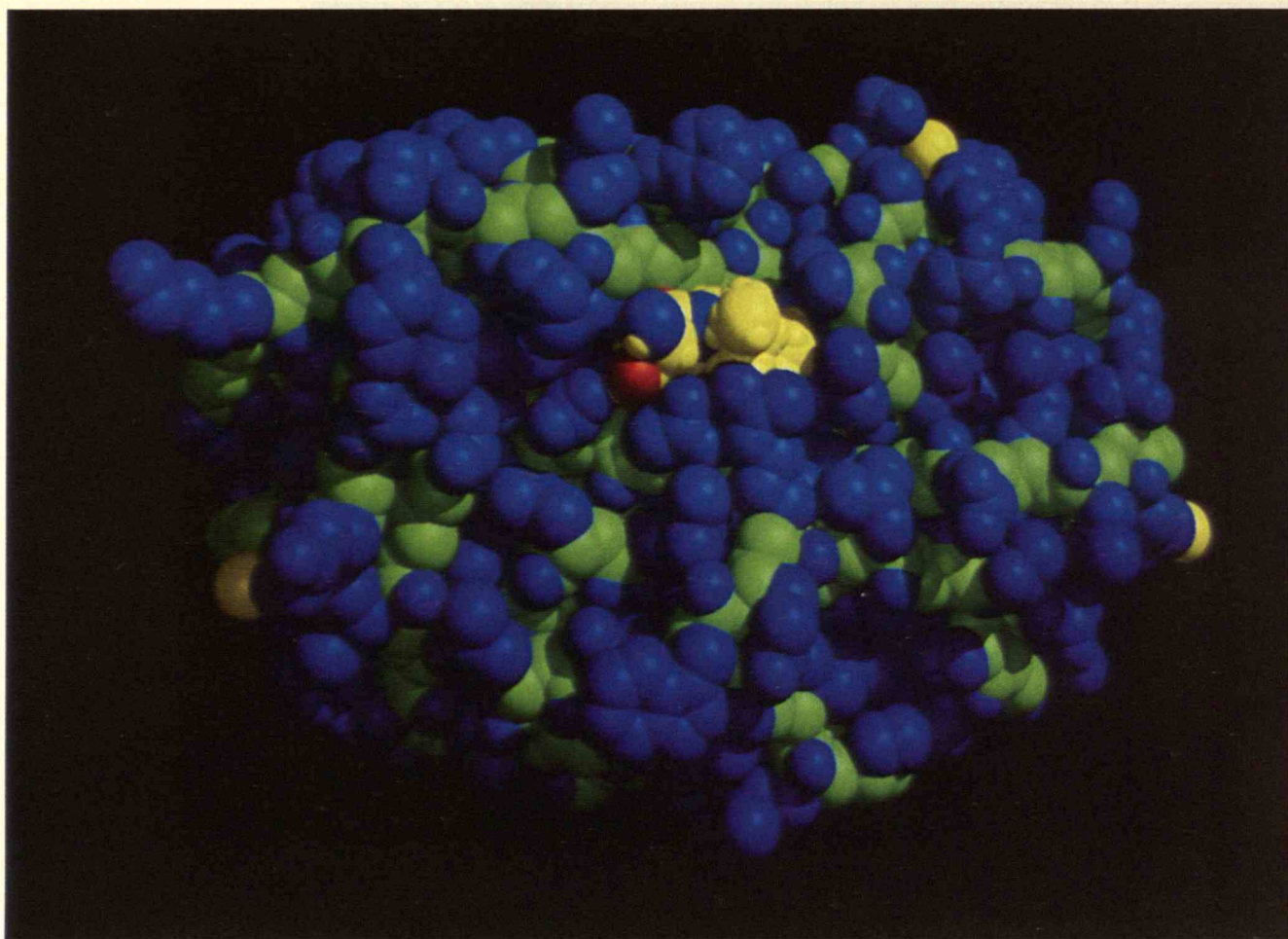
AIDS prevention in the process.

TR: But isn't there a rational fear that people could become infected with HIV if they were injected with a vaccine made of whole HIV that somehow was not fully killed?

KRIM: Yes, but the vaccines to be used in uninfected people will not be made of whole killed virus. The U.S. Food and Drug Administration would probably authorize such a preparation only for experiments in people already infected, as a so-called therapeutic vaccine. Such a preparation could help infected people still capable of mounting an immune response. In fact, the effect of killed HIV is already being studied in HIV-infected humans.

TR: How is AmFAR involved in research on various vaccines and antiviral drugs?

KRIM: We give seed grants in AIDS-related basic biomedical and clinical research, including pediatric research, and psychosocial research. Whenever we have a little money—say, \$1 to \$2 million for a particular program—we let research institutes and universities know. Then we use the peer-review system for judging the pertinence and quality of pro-



In one branch of research on anti-HIV drugs, scientists are trying to develop molecules whose atoms lock into those of HIV protease, an enzyme that plays a critical role in the maturation of the AIDS virus. The locking action could keep the virus from multiplying. The image shows the way one candidate "inhibitor" molecule (the cluster of yellow balls near the center) was supposed to bind to the protease.

posed research projects. The board of AmFAR goes down the lists of applications approved for funding and ranked by an expert advisory committee and awards grants until the money runs out.

I could name 50 or more research projects sponsored by AmFAR that have resulted in very significant advances. One that comes to mind—we funded the original study—showed that detecting HIV's genetic material in the body's cells, as opposed to HIV antibody in blood, was possible. This test is important because the results of antibody tests are negative shortly after a person has contracted HIV.

Leadership, Justice, and Fairness

TR: Your organization also lobbies. What are some important issues to you now?

KRIM: We are against the regulation excluding HIV-positive people from entering the United States. It is a discriminatory practice and not medically justified. The government's

rationale is that these people may be a financial burden on the American public if they need treatment here. But we don't have such an exclusionary rule for some of the other diseases that are as costly to the country in terms of treatment.

If President Bush changed this regulation, and he could do so in an instant, it would change the perception the public has toward HIV-positive people. It would provide an example of leadership, justice, and fairness.

We're also against mandatory testing of physicians. That would be very costly and disruptive and would not increase patients' safety. The way to make the risk even less than it is now—and it's extremely small—is to make sure that all medical facilities practice universal infection-control procedures, such as the appropriate use of gloves, masks, and special disposal or sterilization of any object that has come into contact with body fluids. That will impede transmission of HIV and other dangerous viruses such as hepatitis not only from doctor to patient, but also the other way around.

TR: What do you think the government's role should be in AIDS research?

KRIM: We have regularly lobbied for more federal appropriations for AIDS research and care. The Bush administration has requested a 3.8 percent increase, from \$841 million to \$873 million, for NIH's AIDS research efforts in the coming fiscal year. But that will barely keep up with inflation, and meanwhile the epidemic keeps getting much bigger.

We also need leadership at the highest level of government to mobilize the nation in the fight against AIDS and encourage pharmaceutical firms to develop more drugs, even if this is not really interesting for them financially (though some companies are proceeding on their own because they feel an ethical obligation to do so).

I resent it that President Bush has abdicated his responsibility in this situation. There are many precedents he could draw on. Lyndon Johnson was particularly good at bringing in industry leaders and persuading them that there were certain things they had to do for the public good. For example, he enrolled the help and resources of many companies in doing on-the-job training for undereducated minority youth.

Mr. Bush could say to drug companies, "This problem puts everyone at risk. Tomorrow it could be your children or grandchildren. Those of us who have resources and scientific and technological know-how have an obligation to become involved in HIV research." There is a lot the private sector can do about AIDS, but it needs to be asked, encouraged, and then thanked when it does do something.

TR: Even if more drugs were developed, wouldn't the traditional system of clinical trials be a bottleneck?

KRIM: Yes. The system is clogged. I would estimate that only 400 physicians, all of whom are at university hospitals, are involved in AIDS clinical trials through the traditional government-sponsored system of clinical research in the United States. And these NIH-sponsored clinical trials have involved a few more than 21,000 patients so far. But 600,000 people need treatment today. Many patients are in inner cities, untreated or poorly treated.

We need a creative clinical-trials system that involves community-based physicians who have acquired expertise in the medical man-

agement of people with HIV. These doctors could enroll in clinical trials hundreds of thousands of people who don't have access to university hospitals, or who have not qualified for enrollment in the relatively few trials going on there, or who are simply intimidated by those institutions.

AmFAR started 45 physicians' organizations around the country to conduct clinical research on HIV and AIDS. Either in their private practices or in community hospitals, these doctors care for people with HIV. AmFAR offers these physicians financial support and trains them in the conduct of clinical research. Because patients have confidence in their physicians, they are likely to agree to participate in clinical trials.

The research is more varied in community-based clinical trial groups than in universities. The community group in Boston, for instance, is doing a controlled study of acupuncture for the relief of pain in people with AIDS, because this course of action is believed, but not yet proven, to be helpful.

TR: Michael Gottlieb, a physician who was the founding co-chair of AmFAR, says he was not reelected to your organization's board partly because he took a different stance on community-based clinical trial groups. He has said he doubts whether they will prove productive, as the most promising drugs are tested in traditional clinical settings. He also thinks the quality of research at multiple community sites is not likely to be as good, because community doctors may have a conflict between what they know is best for their patients and what a research protocol says should be done. How do you respond?

KRIM: Of course all new drugs will continue to be first tested in traditional settings. But many trials must be done beyond the initial studies on safety and pharmacokinetics. University-based groups are both overwhelmed with work and don't have enough volunteers for subsequent large trials. Community groups are ideally situated to do large trials, comparing, for example, different treatment regimens.

Moreover, community-based trials are carefully designed so that doctors do not have conflicts: the best interest of the patient comes first. As a result, patients enroll more willingly in community-based trials and are less likely to drop out.

So far, the Food and Drug Administration has approved two treatments based wholly or

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partly on data collected by community-based clinical trial centers. And the trials bring promising experimental drugs to people right where they live. The 24 centers now supported by AmFAR have 1,500 participating physicians, who through their practices have access to 150,000 patients with HIV infection or AIDS. For most of these patients, the community-based clinical trial center represents the only place to get still unapproved but potentially life-saving treatments.

TR: NIH has also set up a community-based trials system, hasn't it?

KRIM: Yes. Following AmFAR's initiative, NIH has funded 17 such centers. But more groups should be started, and the centers now sponsored by NIH need more funding. Over the first two years, the government invested \$9 million in community-based centers. For fiscal year 1993, AmFAR lobbied for \$50 million; the centers will be lucky to get half of that. If the government provided more money for community-based trials and the training of local physicians, the result would be more and better data that would further accelerate drug development and improve treatment.

TR: Given what you say is the need for community-based research, should NIH's priorities be changed to emphasize this work over basic research?

KRIM: Of course not. We've learned an enormous amount about HIV since it was identified in 1985 as the cause of AIDS. But many more basic studies are needed. We don't know, for example, if the virus alone kills immune cells, or if the immune system also kills cells that are not infected but have HIV protein attached to them. Learning whether such an autoimmune response is occurring would enable us to better determine strategies for stopping or slowing the disease's progression.

I would like to see the government raise the proportion of resources put into biomedical research in general, as opposed to military research. The Department of Defense just continues on its merry way developing weapons. Do you know how much we are spending on the Strategic Defense Initiative today when there is no more Soviet Union? Some \$4.1 billion. Compare that with the \$841 million allocated to NIH for basic and clinical AIDS research this fiscal year.

And if you put aside the part of that money going to universities' indirect costs, you're down to approximately \$400 million—the same price tag for one B2 bomber. Of course, there is also some AIDS research going on at agencies other than NIH. But all together, it's still much, much less than the SDI budget. What I'd like to do is take a big chunk from DOD research expenditures and put it into such areas as cancer research, heart research, and AIDS research.

TR: How much attention should the U.S. government pay to the international AIDS situation? The World Health Organization figures that by the year 2000, 90 percent of the 30 to 40 million people that could then be infected will be in the Third World.

KRIM: It's almost futile to discuss how much money we should be channeling overseas. The needs are enormous everywhere, and the tragedy unfolding is immense. At the same time, the commitment to fighting HIV and AIDS in this country is insufficient. The most cost-effective use of resources that will benefit everyone, in the long run, is in the biomedical research effort. I'm convinced that both a vaccine and effective treatment are possible. If we sustain the effort we can come up with both within 10 years.

TR: What does the AIDS epidemic teach us about battling other diseases?

KRIM: Long before AIDS, we needed a national health insurance system; we needed better, accelerated drug development; we needed nursing homes for people with chronic diseases and hospices for people with terminal diseases. AIDS has made these needs obvious and acute because of all the suffering it causes and the urgency and costs it entails.

Our experience with AIDS could enable us to respond better the next time a health crisis arises. For example, as a result of AIDS, Congress passed a law a few years ago setting aside funds to address health emergencies when they occur. NIH and the Centers for Disease Control are to use these funds to quickly mobilize scientific expertise and conduct basic research.

Ironically, AIDS has a positive side. It is accelerating reform of virtually all health-related institutions that don't work very well. ■

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TR92

The Lemon and



PHOTO: ANDREW BRILLIANT; BACKDROP: CAROL PALMER

the Cream

By FREEMAN DYSON

*The true spirit
of scientific curiosity was alive in four
remarkable people who wanted
to try everything.*



THIS article's title, taken from a story in the book *Surely You're Joking, Mr. Feynman*, refers to an incident at a Princeton tea party given by Mrs. Eisenhart in 1939. Princeton is socially a stuffy place, and in the bad old days it was even stuffier than it is now. Mrs. Eisenhart was a legendary figure in the Princeton of 1939. She was the social director of Princeton high society. She decided what was done and what was not done in Princeton.

There were two people in Princeton whom Mrs. Eisenhart was never able to bully. One was Albert Einstein and the other was physicist Richard Feynman. Einstein simply ignored her and refused to go to her parties and wear the proper clothes. He probably had Mrs. Eisenhart in mind when he wrote his classic description of Princeton in a letter to the Queen of the Belgians: "Princeton is a quaint and ceremonious village, peopled by demigods on stilts."

Dick Feynman was too young to ignore Mrs. Eisenhower, but he kept the upper hand by always speaking the truth. He met her for the first time when he had just arrived in Princeton, a young student from Far Rockaway on Long Island, without any training in correct formal behavior. He was invited to one of her tea parties. There she was, in full regalia, pouring the tea, when Feynman approached. She began with the customary ritual, "Would you like cream or lemon in your tea, Mr. Feynman." He replied innocently, "I'll have both, thank you."

That completely flummoxed her. That had never happened before at one of her tea parties. All she could do was to fix Feynman with an icy stare and say, "Surely you're joking, Mr. Feynman."

Fortunately, the social snobbery that used to flourish in Princeton is now dead. Instead we now have academic snobbery, the snobbery of people who think that just because they work at a university and have a PhD after their name they are a superior breed and are entitled to despise the others who don't have a PhD and who have to work at intellectually inferior jobs in industry or business. We several times offered Feynman a professorship at Princeton and he always turned us down because he could not stand the snobbery.

The reason why Feynman had such a rich and exciting and useful life is that he began by saying yes to everything. That is what it means not to be a snob. A snob is somebody who is always saying no to things. A snob says no to things because they are not proper, or because they are vulgar, or because they are just not done, or because they are low brow, or because they are beneath the dignity of an intellectually superior person.

Dick Feynman said yes because he wanted to try everything. He said yes to the lemon and also to the cream. That is the story of his life. By saying yes to things he got into all kinds of trouble. He got into absurd and unnecessary disasters. But then, when he had tried something out and it ended badly, he had the strength of mind to say no. He was firm in saying no after he had said yes and proved to himself by first-hand experience that something was no good. He said yes to Princeton when he came there as a student, and then, after he had tried Princeton's intellectual high society and decided it was a fake, he said no to Princeton for the rest of his life.

The book *Surely You're Joking, Mr. Feynman* is the

best antidote to academic snobbery. It has a wonderful collection of stories, all true, about Feynman's undignified adventures. It has a highly uncomplimentary description, also true, of the Institute for Advanced Study in Princeton where I work, and of the reasons why Feynman—who spent much of his career as a professor of physics at Caltech—never wanted to work there. And it has the best account ever written, also true, of what it was like to be working at Los Alamos during the time the first atomic bombs were put together.

After Feynman died in 1988, his friend Ralph Leighton put together another book, *What Do You Care What Other People Think?* The title is a quote from Feynman's first wife Arlene, who died in 1945. Feynman said yes to Arlene, even though they both knew when they married that she had only a couple of years to live. Feynman said yes again, forty-four years later, when he was asked to serve on the board of enquiry investigating the *Challenger* disaster, although he had barely survived his second big cancer operation and knew he had not many years to live. He saw the enquiry as a great chance to educate the American public, to show it a little bit of real science in action. He grabbed the opportunity and made the enquiry a moment of truth for the American people.

What Do You Care What Other People Think? is a second collection of stories, but more serious than the first. Half of this second book is about Arlene, the other half about the space shuttle. And this time Feynman is not joking. Arlene's short life was a tragedy, and the *Challenger* disaster was also a tragedy. Feynman did not close his eyes to tragedy. He knew as well as anyone the bitterness of chronic illness and early death. But he also knew, as Shakespeare knew, that in every tragedy there are moments of comedy, moments when the tragic hero steps aside and lets his place on the stage be taken by the clown.

To remain sane as Feynman did in the midst of tragedy, it helps to be a bit of a clown. Feynman said yes both to tragedy and to comedy. Even when he was most serious, nursing Arlene through her last weeks in Albuquerque, or digging out the causes of the shuttle disaster in Florida, or struggling in Ithaca with the infinite self-energy of the electron, he was never solemn.

Of Boas and Bombs

Dick Feynman was a great communicator. I never saw him give a lecture that did not make the audience laugh. And yet, I never heard him talk down to an audience. His lectures were serious, full of scientific meat, often difficult. He was always more concerned with the scientific substance of his talks than with the jokes. The jokes just came to him naturally. And the jokes gave his audience a feeling for the joy of doing science. Better than

FREEMAN DYSON is a physicist who has made a hobby of writing books for the general public. He is a professor at the Institute for Advanced Study in Princeton, N.J. This article is adapted from a chapter in his book, *From Eros to Gaia*, ©1992 by Freeman Dyson, to be published in July by Pantheon Books, a division of Random House, Inc. The chapter is based on the author's talk given in 1988 in response to the Gemant Award, conferred by the American Institute of Physics for "creative work in the arts and humanities that derived from a deep knowledge of and love for physics."

anybody else, Feynman was able to convey to the public the simple no-nonsense common sense that is at the heart of all good science.

His finest hour as a communicator came when, already mortally ill, he performed an experiment at a televised session of the shuttle enquiry. He demonstrated on-camera the loss of resilience of a piece of the shuttle O-ring after it was dunked in a glass of ice water. Viewers saw with their own eyes how science is done, how a great scientist thinks with his hands, how nature gives a clear answer when a scientist asks a clear question.

Feynman tells us, in his account of the shuttle enquiry, that the staging of the O-ring experiment was not as easy as it appeared. Like all good demonstration experiments, it needed careful preparation and careful timing. Feynman had to fight hard to make sure the experiment would actually work in the short time it would be on camera.

The last time I went to see Feynman at his home in Pasadena, I found him recovering from a typical Feynman disaster. He had run into trouble baby-sitting for a boa constrictor. His teenage daughter had a friend, and the friend had a pet boa constrictor, and the friend went away on vacation for a month, and so Feynman found himself responsible for its care and feeding.

The snake was supposed to eat live white mice, but when Feynman fed him the mice he was too stupid or too lazy to catch them. Instead of the boa constrictor eating the mice, the mice began eating the boa constrictor. So Feynman had to sit up at night to stop the mice from nibbling holes in the snake's skin. And then, when its owner came back, she scolded Feynman for taking care of her pet so badly. He said he had learned something from the experience. In the future, if anybody



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clowning
simultaneously.*



asked him to baby-sit for a boa constrictor, he would say no.

The story of Feynman's involvement with nuclear weapons was like the story of the boa constrictor. He worked on the Manhattan Project when he was a young man in his twenties. He started in the isotope-separation part of the project at Princeton and then went on to Los Alamos. He worked hard and was very good at it. This was before the days of electronic computers. All the detailed calculations of the hydrodynamics and radiation in a nuclear explosion had to be done by hand. Feynman organized the human

computers and infected them with his enthusiasm so that they got the numbers out in time. These were the first accurate calculations of what happens in a nuclear bomb when it goes off. Feynman at the age of twenty-seven had a big share of the responsibility for the fact that the first bombs did what they were supposed to do when they were dropped.

The reason why Feynman said yes to the bombs, when he was asked to join the project at the beginning, was the same reason all the other physicists gave for working at Los Alamos. There was a war on, Hitler was still going strong, and people were scared of what Hitler might do if he had the bomb and we did not. They thought they were in a race against Hitler for the bomb, and it seemed like a good idea to work as hard as possible to make sure the United States would not lose the race.

Besides this patriotic reason, Feynman also had personal reasons for working hard at Los Alamos. The bomb was something real, it was an exciting scientific challenge, and it was a job he happened to be spectacularly good at. He naturally said yes because it was his nature to say yes to any new and unlikely adventure.

After the project succeeded, after the

bombs were dropped on Hiroshima and Nagasaki and World War II was over, Feynman realized that nuclear weapons were no good. He understood that we would be living in fear of nuclear weapons for the rest of our lives, and he decided to have nothing more to do with them. In 1946, when he left Los Alamos, he gave up his secret clearances and said no to any further involvement with military projects.

Feynman looked back at what he had done at Los Alamos, believing at the time that it would make the United States safer, and saw that it actually made the United States more unsafe than it had ever been before. He did not regret having been at Los Alamos, just as he did not regret his battle with the boa constrictor 40 years later. The lesson of Los Alamos was the same as that of the boa constrictor. It is all right to say yes once to a dumb idea, to try it out and see if it is any good. But you are a fool if you say yes twice to the same dumb idea. After things turn out badly the first time, you say no.

In a letter to my parents written before I had come to know Feynman well, I described him as "half genius and half buffoon." This was partly true, but it was not the whole truth. A better description would have been that Feynman was *all* genius and *all* buffoon. The deep thinking and the joyful clowning were not separate parts of a split personality. He did not do his thinking on Monday and his clowning on Tuesday. He was thinking and clowning simultaneously. During the early years when I knew him best, he was at the same time gregarious and intensely private, banging away at his bongo drums and mourning his dead wife. He was adventurous and at the same time critical. He took the lemon and the cream of his life together.



The Man Who Invented ET

Another of my heroes is Philip Morrison. He is, like Dick Feynman, a lemon-and-cream character. Morrison has done much, in many different ways, to bring human concerns into science and to bring science into the mainstream of humanistic culture. A physicist and Institute Professor at MIT, he has been active as a teacher, as a reformer of school curricula, as a writer, and as an incomparable reviewer of books, besides being a first-class scientist and an effective politician.

I remember vividly the first time I heard Phil talk

to a public audience. It was in the winter of 1947, soon after I arrived in the United States as a graduate student. Phil was talking in Ithaca to the local chapter of the Federation of Atomic Scientists. He was describing the island of Tinian in the Marianas as he had seen it in the summer of 1945, when he was preparing equipment for the nuclear missions against Japan. Phil could make your flesh crawl with the starkness of his language. He spoke of the island, bulldozed flat, turned into one vast airfield, five hundred heavy bombers landing and taking off with their great loads of high-explosive and incendiary bombs, the air constantly rumbling with the greatest concentration of military power ever before seen on this planet.

That immense concentration of power was what it took to destroy a city, until Hiroshima. And then Phil described how he watched the *Enola Gay* take off, a single airplane lofting gently into the dark sky, attracting no attention, to outward appearance no different from her five hundred sisters on the island. And that single airplane, within a few days, changed the incessant roar and turmoil of the island to silence.

When I heard Phil speak in Ithaca, it

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was not the first time he had told that story. He had told it to bigger and more important audiences in Washington. He had told it in testimony before congressional committees. Everywhere he went, he left behind him a profound impression. Of all the scientists who were then trying to teach humankind the facts of our nuclear predicament, Phil was the one who spoke most clearly, most simply, and most effectively.

Then again, 12 years later, it was Philip Morrison and his friend Giuseppe Cocconi who invented ET. They demonstrated, with simple scientific arguments, that humans could use radio telescopes of feasible size and sensitivity to search for radio signals transmitted by extraterrestrial civilizations. This demonstration led to the start of observational programs, which now, after 30 years, have become much more sophisticated and efficient. In the meantime, the idea of ET has become firmly rooted in the imagination of people all over the world. Of all Morrison's great contributions to public education, ET is probably the one that will be remembered the longest.

Adventurous and Critical

I happen to be a naturalized American who was originally English, and I am proud of both my countries. Both England and the United States have done well by being adventurous and critical at the same time. The British Empire was an absurd adventure. How could a little island like England run the affairs of half the world? But the absurdity of it all didn't stop the empire builders from doing it rather well most of the time.

I come from a family of empire builders and I used to have uncles and aunts scattered all around Africa. My favorite uncle was Oliver Atkey, a medical doctor who spent his life in the Sudan training Sudanese doctors and building up from nothing a public health administration for a country twice as big as Texas. The colonial medical service was like the Peace Corps, except that it allowed people to stay in one place for 30 years and gave them the chance to create something permanent. Uncle Oliver loved the Sudanese. After he retired, his apartment in London was constantly full of Sudanese friends who came to see him when they were visiting England.

The empire was in many ways a good thing while it lasted. It gave Oliver a wide horizon and let him practice his trade on a scale he never could have imagined had he remained an ordinary physician in England. I am not denying the dark side of the empire, the many grievous mistakes and crimes that were committed in the course of its history. The Sudan today, with chronic civil war and famine in the southern provinces, has hardly fulfilled the high hopes that Uncle Oliver and his wife Dulcibella had for its future. But the empire also had a bright side in the opportunities it gave to people like

Oliver and Dulcibella, who were both adventurous and critical. They were adventurous enough to take on the impossible job of organizing and molding whole continents of alien people in their own image. And they were critical enough to understand when the time had come to quit and go home.

My aunt Dulcibella was perhaps an extreme case. She was the first woman in England to take out a license to pilot an airplane. She persuaded Oliver to buy an airplane in the 1920s, when airplanes were hardly a reliable means of transport. Oliver used his airplane to descend unexpectedly on medical stations in distant parts of the Sudan, so that he could check what kind of a job his trainees were doing in the villages.

When they had vacations, Oliver and Dulcibella flew crazy trips in their airplane all over Africa. Once they looked out the window of the airplane over some remote region and saw a man in a field below being mauled by a lion. They landed in the field, scared away the lion, rescued the man, bundled him into the airplane, took off, and flew him to a hospital and saved his life. I know this story is true because I met the rescued man in London afterwards. He had lost a piece of his nose but was otherwise in good shape.

Another of my African cousins, likewise adept in saying yes to lemon and cream, settled in Rhodesia and remained a staunch supporter of white supremacy throughout the years of Rhodesian independence, and now continues to live there peacefully as a citizen of Zimbabwe. At the time of the transfer of power he wrote to me, "Of course we will get along all right with the blacks. If we hadn't been able to get along with the blacks, we wouldn't have lasted six weeks."

He wrote more recently that he went on vacation to Victoria Falls, the great tourist attraction of Zimbabwe, and was happy to see there the statue of the Scottish doctor David Livingstone still standing. Commemorating Livingstone's discovery of the falls in 1855, the statue's original inscription still proclaimed to the tourists: "EXPLORER, MISSIONARY, LIBERATOR." The word LIBERATOR records the fact that Livingstone was engaged in putting an end to slavery in Africa at the same time as his contemporary Lincoln was putting an end to it in the United States. If we are wise, we may hope to be remembered with words like these, a hundred years after our death.

When to Say No

I am hoping that Los Alamos, and the whole nuclear weapons enterprise it helped to engender, will have a history like that of the British Empire. Los Alamos was a great adventure for people like Dick Feynman who went there at the beginning. Most of them would probably have gone there and said yes to the challenge of

building a nuclear bomb even if Hitler had not given them the political excuse. It was inevitable that human beings in various countries would rush into the excitement of building bombs when the possibility of it was first discovered. It was a grand thing for young scientists to do something new and extraordinary, to bring down to earth the energy that fuels the stars.

The first generation of bomb builders was like the first generation of empire builders, young and enthusiastic and intoxicated with success. But then it happened with nuclear weapons just as it happened with the empire, that the pioneers settled down and became bureaucrats. Or the pioneers moved on and the bureaucrats took over. The nuclear weapons enterprise became a stodgy political establishment with a superstructure of dogmatic belief to justify its existence. In the later phases of the British Empire, we had the theorists justifying it with their dogmas of manifest destiny and the white man's burden. In the later phases of nuclear weaponry, we've had the theorists justifying it with their dogmas of stable deterrence and invulnerable second-strike capabilities.

In both cases, as the dogmas become more arcane and elaborate, the absurdity of the whole enterprise becomes more obvious. It was absurd to have ever imagined that a small island could permanently rule half the world, and it was absurd to have ever imagined that nuclear weapons could permanently keep the world at peace. The time has now come to say no to nuclear weapons just as we said no to the empire. Dick Feynman understood this and said his no when he left Los Alamos 46 years ago.

The question now before us is how to dismantle the nuclear weapons empire. To dismantle an empire is not easy. It takes a



long time and has to be done carefully. Even with the best care it is not painless. When empires crash, people get hurt. It took us 30 years to dismantle the British Empire, and the job is still not finished. There are still some tough little remnants in such places as Ireland and Hong Kong and the Falkland Islands. But on the whole we can look back on the dismantling with pride. It was done for the most part peacefully and in such a way as to hurt as few people as possible.

If we go at the job of dismantling the nuclear weapons empire with courage and determination, there is a good chance we may see that

job done in 30 years too. There may be some untidy ends left over, but it should at least be possible to get rid of the major nuclear weapon deployments all over the world within the lifetime of our children.

I have written about four people who acted for me as beacons, drawing me out of my narrow concentration upon science into a wider involvement with the great problems of human society. When I was a teenager in England, Uncle Oliver and Aunt Dulcibella filled my bookshelves with the flaming red monthly selections of the Left Book Club. He was a socialist and she was a member of the British Communist Party, pledged to demolish the empire that they loyally served. When I came to the United States, Phil Morrison and Dick Feynman continued my political education with their stories of Los Alamos.

All four of them were role models, showing me how an uncompromising pursuit of excellence in a demanding professional discipline could be combined with joyful adventures in the world outside. Each of them was at heart a revolutionary, yet each retained the respect of the establishment. All of them knew how to enjoy the lemon and the cream and make the best of both. ■

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MIT

JULY 1992

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DECEASED LIST

PUZZLE



Cover:

Jordan Dentz, '88, helps install a 22-inch-high triangular ridge beam, a key component of the new roofing technology described in the article beginning on page MIT 8.

Photo: Richard A. Chase

2 THE EXTINCTION OF THE DODO,
PARTS II AND III

"Meanwhile, EC-1's graceful loops eventually terminated in an equally spectacular splash, bringing the story—until now almost unknown in the annals of MIT—to its melancholy end."

—John Mattill, Technology Review,
Feb/Mar 1992 (p. MIT 12)

To quote Yogi Berra, "It ain't over 'til it's over." I was on summer vacation from high school when the EC-1 made its "spectacular splash" somewhere south of Winthrop during the summer of 1931. Observers did not have a very accurate fix on the location, and at low tide the wreck was not observed on the then-existing mud flats. Conclusion: it fell in the channel that ran east and west from Point Shirley to the old East Boston Airport between the south shore of Winthrop and Apple Island.

At low tide on the morning after the crash, one of my schoolmates, George Merrill, an older man, Jack Wheeler, and I started dragging a grappling hook in an attempt to snag the wreckage. It wasn't until the third morning, with the tide down and the water dead calm, that we spotted a slight oil slick and finally made contact. We placed two rowboats over the wreck, laid a beam across them with the grapple line made fast to it, and let the incoming tide do the lifting. The assemblage was towed to shore at high tide until it grounded out. The more the tide receded, the more observers we attracted.

Eventually, the wreck was on "dry ground" and it was "attacked" by souvenir hunters. Somehow the owners heard about the recovery. They came and took away the engine and the wheels, leaving the stripped fuselage. The wing was never recovered. Our hope for salvage was dashed when we received only a thank you. But then again, it was 1931, and who had any money?

— This was still not the end of EC-1. I set the stripped fuselage frame on end and cast four concrete blocks at the corners. Using a rig similar to the recovery setup, I let the tide lift it and set it down near the rocks off the Cottage Park Yacht Club channel as a homemade beacon to the visiting yachtsmen who would arrive for the annual three-day

regatta held each Labor Day weekend.

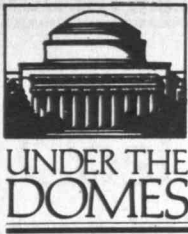
For those old enough to remember, we were in a very cold cycle of weather in 1931. Parts of Boston Harbor were regularly freezing over. I can't say for sure, but the ice probably froze on the fuselage and an incoming tide picked it up for the third time and carried it out by Deer Island light to a deserved deep-water burial.

JOHN B. NUGENT, '37
Braintree, Vt.

AUTHOR'S NOTE: Professor Emeritus Eugene Larrabee, SM '48, has provided a number of corrections and footnotes to the EC-1 story from his file, from recollections of his conversations with the late Professor C. Stark Draper, '26, and from correspondence with Mrs. Francis Pierson, wife of the ill-fated plane's last pilot, and Mrs. Manfred Rauscher, whose husband was one of the plane's designers.

Larrabee's most important point is that the little plane that pioneered swept wings was correctly called the EAC-1 for its builders' company, Engineers Aircraft, Inc. EAC-1 did have an unexpected aerodynamic characteristic—but not as we were told. Instead of looping continuously, the plane could not be made to loop. Those who tried found themselves performing what are called Immelmann turns—the plane completed the forward half of a loop from erect flight but then performed a half snap roll, which turned the machine right side up again, flying in the opposite direction. No one could perform the complete loop. Colonel Charles A. Lindbergh did indeed fly the EAC-1; he made several Immelmanns, and observers guessed that he had tried to complete a loop. He couldn't.

The final flight occurred when Olof Pierson, '29 (not Pearson), deliberately flew the plane upside down while trying to dislodge some impediment—perhaps an abandoned tool—that prevented free movement of the control stick. The plane's single safety belt, which held both pilot and passenger in the plane's side-by-side seating, failed and Olof fell out. Although the passenger succeeding in hanging on and righting the plane, he felt unable to land and also parachuted to safety. The plane, unstable without passengers, made several spectacular swoops before plunging into Boston Harbor. Pierson, who had planned to study EAC-1's propensity for Immelmann turns for his master's thesis, had to find another topic.—J.M.



See You in Court

MIT is scheduled to go to court on June 25 to contest a Justice Department charge, filed in May 1991, that MIT and the eight members of the Ivy League violated the Sherman Antitrust Act. The government's stated target was the "overlap" meeting. At this annual session, the schools tried to determine a reasonable "family contribution"—what the families of the 3,000 or so students offered admission to more than one of the participating institutions could afford to pay—based on the shared information gleaned from their own financial aid forms, interviews, or other sources.

Overlap meetings were a practice of more than 30 years' standing for MIT and the Ivies. They were a tool that helped the schools implement "need-based financial aid," under which each student is offered only enough assistance to cover the difference between what his or her family can afford to pay and the costs of attending a particular school for one year. By contrast, the schools believed, competing for the most talented students through offers of unneeded scholarships would quickly deplete aid resources.

Once the family contribution for the

overlap students was determined, the individual schools' financial aid officers went home to calculate each student's need and design a financial aid package to meet it.

At MIT, the overlap meeting was considered an essential step toward "need-blind admissions," a policy in place since 1957, whereby a student's ability to pay for the cost of an MIT education is not taken into account in the admission decision. In fact, the Admissions Office doesn't even know if an applicant has also applied for financial aid. Once a student is admitted, MIT undertakes to provide an aid package—in the form of grants, loans, scholarships, and campus jobs—that fills demonstrated need. In 1990, 57 percent of the freshman class required financial aid. Under the circumstances, it is essential that the Institute provide just enough aid for each individual—and no more.

Faced with the Justice Department suit (launched in the Federal District Court in Philadelphia by former Attorney General Dick Thornburgh), all the schools except MIT signed a consent decree voluntarily ending the overlap meetings. MIT is the only institution that refused to back down and is the only one now facing a court suit.

In an editorial on May 2, the *New York*

Times referred to the case as "destructive" and "unworthy of litigation," and noted that the Institute spends more than \$20 million of its own charitable resources annually to provide student aid. Meanwhile, Provost Mark Wrighton told the faculty that this suit is the major factor in sharply higher legal expenses projected for fiscal 1993. □

Commencement '92 Speaker: Les Aspin

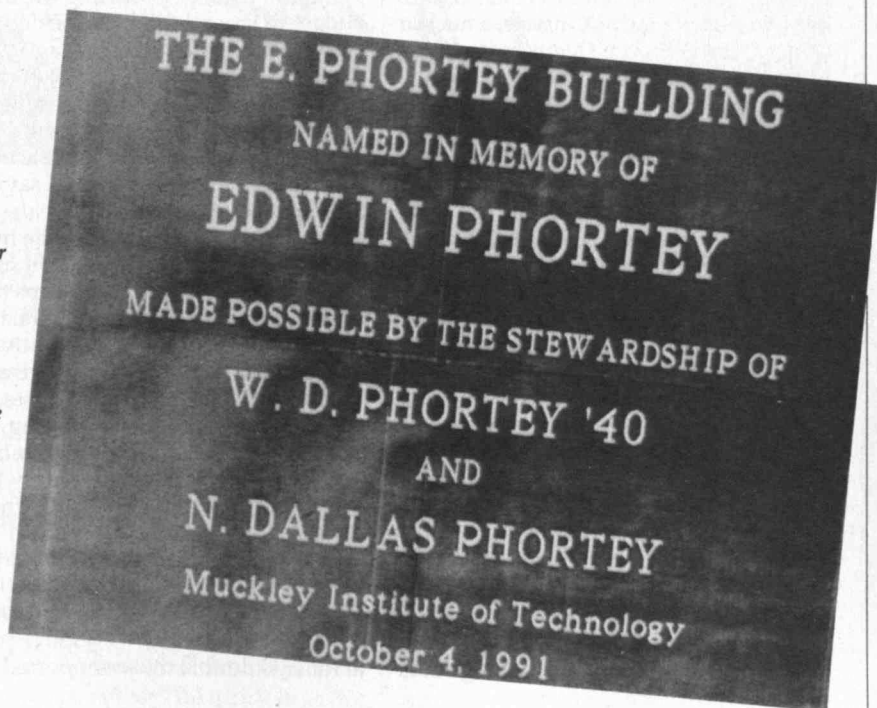
U. S. Representative Les Aspin, PhD '66, a key member of Congress in the shaping of national defense policy, was the MIT commencement speaker on June 1 (after *Technology Review* went to press). He was chosen by the president, who receives a list of speakers proposed by members of the MIT community and vetted by a subgroup of the Commencement Committee, headed by Prof. Martin Schlecht, '77.

President Charles Vest noted that the Wisconsin Democrat "has a unique perspective on important issues of our time, particularly those involved in our shifting national priorities as defense needs adjust

PLAQUE HACKED

Imitation may be the sincerest form of flattery elsewhere, but at MIT, the highest compliment is a hack. When a bronze plaque was installed in Building E-40 on Amherst St. preparatory to naming the building for Dwight S. Muckley, the father of Harold J. Muckley, '39, a person or persons unknown went to work. Apparently aware that foundries often protect plaques with a rubbing during transport, the hackers removed the brown paper covering on the piece, took a rubbing of the engraved surface,

and created this altered version on a computer. The dedication to the well-known Mr. Phorthey was installed over the original, the brown paper was put back in place, and the hackers waited for Chair of the Corporation Paul Gray, '54, and members of the Muckley family to arrive for the unveiling. Although the prank was "uncovered" just before the ceremony, it was incorporated into the occasion, to much hilarity. Elizabeth Muckley was so tickled she insisted on keeping the forgery as a souvenir.



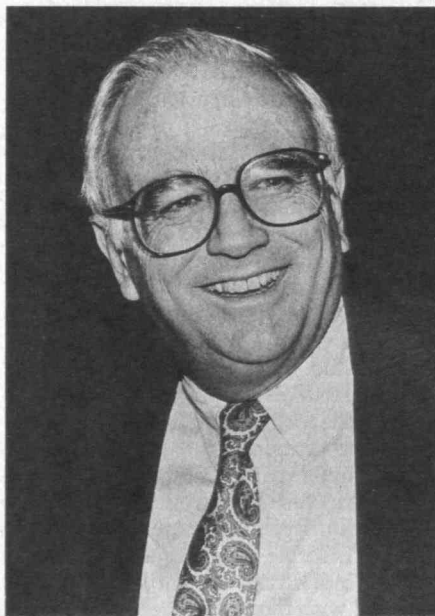
to changing conditions and civilian issues come to the fore."

As chair of the House Armed Services Committee, Aspin wields an influence over the military budget unmatched by anyone but his counterpart in the Senate, Sam Nunn. For many years Aspin was seen as a junior partner to the much more widely known Georgia senator, who until last year was considered the Democratic Party's most credible voice on defense matters. But events of the past two years—in particular, the Persian Gulf war and the legislative fight over how far and how fast to reduce defense spending—have hastened Aspin's political maturation.

Aspin's interest in defense matters has been evident since his early days in Congress, when he was a sharp critic of the Pentagon's military and spending priorities. Over the years, however, he tempered his views to win substantial support among his colleagues during a bitter fight for the committee chair in 1986. Aspin distinguished himself in that struggle by successfully bucking the "go-along-to-get-along" House seniority system. Not only did he defeat a sitting committee head, but he did so by convincing his fellow Democrats to pass over five members with greater seniority.

Upon winning the chair, Aspin jumped into one of his most controversial battles by championing the MX missile, a nuclear weapon many House Democrats considered dangerously destabilizing. (Some, like Howard Wolpe of Michigan, went so far as to claim that Aspin had deceived them by explicitly promising to oppose the MX.) Tip O'Neill, then speaker of the House and an opponent of the MX, said Aspin was "a tremendous factor" in a successful House vote to unlock \$1.5 billion for production of 21 MXs in 1985. Angry Democrats ultimately deposed Aspin from his chair in 1987, but he landed on his feet and regained the post two weeks later. Perhaps in part to placate his colleagues, he then supported a House move that successfully capped MX production at 50 missiles rather than the 100 requested by the Reagan administration.

Aspin has continued to steer a middle course through the minefields of defense policy. When Congress debated the use of force in the Persian Gulf, many Democrats took shelter behind Nunn, who argued against military engagement



Les Aspin

and in favor of continued sanctions against Iraq's Saddam Hussein. But Aspin favored the war and predicted that conflict, if it came, would be short and decisive. It was, and Aspin's stock rose accordingly.

Since the war, Aspin has taken on the Pentagon itself over cutting the defense budget, a struggle that has yielded decidedly mixed results. The Pentagon's budget, parts of which it drew up before the Soviet Union collapsed last August, calls for a force reduction of 25 percent and major cuts in the B-2 bomber and the Seawolf submarine programs, for total savings of \$43 billion over the next five years. Aspin attacked that plan, ridiculing the military scenarios the Pentagon offered in support, such as one requiring U.S. troops to fight against a Russian invasion of Lithuania. In its place, he offered five alternative budgets backed up by his analyses of nations that he believes the United States might someday have to fight: Iraq, Iran, Syria, Libya, North Korea, China, and Cuba.

Defense experts have widely hailed his scenarios as more credible than the those of the Pentagon. (Aspin's preferred plan of the five would save \$91 billion over five years.) Credibility notwithstanding, in its first test—the 1993 Pentagon budget—Aspin's proposal for cuts double those supported by the

administration went down to defeat.

Aspin is a 1960 graduate of Yale University, where he was a member of Phi Beta Kappa. He received a master's degree from Oxford (with a combined major in economics, politics, and philosophy) and a doctorate in economics from MIT. After coming to Washington to join the staff of Senator William Proxmire, Aspin also served as an assistant to Walter Heller, the head of President Kennedy's Council of Economic Advisors, and to Secretary of Defense Robert McNamara. Aspin joined the faculty of Marquette University in Milwaukee as an assistant professor of economics, and was first elected to Congress in 1970.—David P. Hamilton, '88 □

The author is a reporter at Science magazine.

Keeping the Bush Award in the Family

The National Science Board has bestowed the 1992 Vannevar Bush Award on MIT President Emeritus Jerome B. Wiesner. The 24-member NSB is the policy-making body of the National Science Foundation, and it has been giving the Bush Award since 1980 to honor "a senior statesman in science and technology who . . . has made an outstanding contribution toward the welfare of mankind and the nation."

The NSB noted that Wiesner, a science advisor to Presidents Kennedy and Johnson, has been called the "conscience of the scientific community" for his long-term contributions to public understanding of the risks of the nuclear age and his efforts to reduce those risks. The award citation describes Wiesner as a "humanist-engineer . . . [who] helped transform the information and communication sciences by grasping the essential fusion of their technical and social dimensions."

The award is named for the late MIT professor, vice-president, and dean of engineering, Vannevar Bush, who organized and led American science and technology during World War II. He died in 1974. The first Bush Award went to another MIT great, the late James R. Killian, Jr., '26, an MIT president and chair of the Corporation and the nation's first full-time presidential science advisor. □

Indirect Cost Debate: *Some Cautious Optimism, Some Apprehension*

By Susan Lewis



As of mid-May, there were no new headlines blasting MIT for allegedly overcharging the federal government on the indirect costs of research, costs the Institute incurs for administration, facilities, and support services as a result of its federally sponsored research activities. But the disagreements continue—even grow more disturbing—between the government and the Institute.

In 18 months of negotiations with an alphabet soup of federal agencies, conducted in a vernacular of auditing that defies translation into English, the

indirect cost issues that most alarm the MIT faculty and administration boil down to two: will the government insist on retroactive changes in its contractual funding arrangements with MIT, and will it require MIT to drastically alter the way tuition for graduate student research assistants is funded?

"This is an incredibly arcane topic," President Charles Vest admitted in an interview with *Technology Review* in April, and he's not surprised that outside media have mainly focused on possible abuses.

Take the issue of retroactively changing the rules. The guidelines for

allowable expenses for university research are laid down in Circular A-21, which is produced by the Office of Management and Budget (OMB) in the White House. It specifies such things as a standard method for calculating the proportion of library expenses that are charged to research. If a university believes that its particular circumstances don't fit the A-21 framework, the document allows for a special study or a Memorandum of Understanding (MOU) with its "oversight" agency.

In 1984, armed with a government-approved study showing that more

than half of its library use was research-related, the Institute negotiated an MOU allowing 49 percent of library expenditures to be included in calculations of indirect research cost. It was a five-year agreement, covering 1986–91. In an audit report for fiscal 1990, released in March of this year, the Defense Contract Audit Agency (DCAA) said that MIT should be held to the standard formula, which yields a library recovery rate of about 24 percent, and that MIT owes the government \$2.9 million. At press time, the Office of Naval Research (ONR), the oversight agency for all federally sponsored research at MIT, was reviewing both the DCAA audit and the MIT response and had not yet announced a decision.

Library costs are only one—albeit a very important one—of the 10 budget areas in which MIT has what it considers a legally binding MOU. In addition, in areas where Circular A-21 was vague, MIT and ONR had developed their own practices, which were approved in subsequent DCAA audits, according to James Culliton, vice-president for financial operations. All told, retroactive changes to items covered by MOUs or accepted practices accounted for all but a small fraction of the \$22.8 million in overcharges DCAA is claiming in the 1990 audit. And that's just 1990. Presumably, bills for other years will be forthcoming. (The Institute books are still open for the years 1986–91, because the final audits by DCAA are overdue.)

"In terms of our vulnerability to unbelievably large financial penalties," President Vest says, "the retroactive changes in MOUs constitute the biggest problem between MIT and the government."

MIT administrators are cautiously



optimistic about the prospects for their line-by-line response to the specific changes in the 1990 audit. From the total of \$22.8 million questioned by DCAA (out of a total bill of more than \$700 million for federally sponsored research on campus and at Lincoln Laboratory) MIT has refuted all but \$1.2 million, and campus officials anticipate that ONR will rule in MIT's favor.

Universities are also expecting an overall improvement in the indirect cost arena by next October, when a special task force convened by OMB and the Office of Science and Technology Policy is scheduled to unveil a revised Circular A-21. Items heretofore left vague are expected to be spelled out in detail, and President Vest is also hoping that the revised A-21 will simplify some of the most cumbersome present practices. "[OMB] is where we believe the primary deci-

sions should be made, as opposed to the legislative budget process," Vest says.

The task force is undertaking a significant number of in-house studies, Vest notes, and is consulting both the Association of American Universities and the Council on Governmental Relations (COGR), which consists of more than 100 research universities. In addition, COGR is coordinating its own study of some 20 universities, including MIT, to provide clear, detailed information, in a common format, on the real costs of university research. "It is a cooperative effort, with the task force, to be sure that the facts are well understood as they begin to look at revisions," says Vest.

Administrators have some basis for optimism on the retroactivity issue, but when it comes to MIT's second major concern—the government

challenge to the Institute's long-standing method of funding tuition for graduate students—the campus mood is much more apprehensive. Tuition remission is an element in the support MIT provides for graduate students. Traditionally, faculty covered tuition for their graduate students through their research grants, but years ago the Institute realized that this approach penalized faculty for working with research assistants as opposed to postdoctoral fellows or other types of research staff.

As an institution committed to what Vest terms a "melding of research and education," MIT made a policy decision that it would subsidize tuition for graduate student research assistants and teaching assistants through employee benefits. In 1983, it negotiated an MOU with ONR allowing the graduate tuition bill to be included in the employee benefit pool for purpos-

es of calculating indirect research costs. With this regimen in place, principle investigators only had to cover the stipends and benefits for graduate students through research contracts, and the number of research assistants at MIT climbed from 1,500 in 1983 to 2,100 in 1991.

Only MIT, Caltech, Columbia, Stanford, and the University of Minnesota are permitted by their oversight agencies to use this mechanism to cover RA/TA tuition. Last summer, the White House Office of Management and Budget decided that these five schools should get in line with everybody else and treat tuition as a direct charge to individual research projects. That would jack up the cost of hiring a graduate student on this campus, for example, from an already high \$30,000 to about \$50,000. OMB was

persuaded to hold off on a final decision until it had studied the implications of such a change, including its impact on the production of PhDs. MIT et al were granted a reprieve until a decision is made—expected as early as this month.

"We believe that if this mechanism were suddenly disallowed, and no other structural changes were made," Vest says, "we would see a 20 or 25 percent decrease in the numbers of PhDs educated here."

"Our stance is not that these five schools should have some kind of special deal," Vest points out. "Many other universities would like to use this mechanism, and we believe strongly that they should have the option, if they meet the test of net cost savings to the federal government."

How does the RA/TA tuition-benefit system work and does it actually save the government money? The

★
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and the federal
government.*
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costs of all employee benefits (such as MIT's share of health insurance, retirement plans, etc.) are added up and then divided by the total cost of salaries and wages. This gives a percentage benefit rate—now 40 percent—that is applied to each individual salary and is charged to the account that covers that salary. When a salary and associated employee benefit rate are charged to a federally sponsored research account, the government agency funding that project pays those costs. When a salary and benefits is charged against MIT general accounts, MIT pays those costs. The effect is the same on industrially funded research projects.

This method spreads the cost of the tuition for the 2,100 research assistants and 500 teaching assistants over the accounts covering all 10,000 employees of MIT, including Lincoln Lab. If the tuition were withdrawn from the

benefits pool, thereby lowering the benefits rate applied to salaries charged to direct research costs, that would also lower costs for federal funding agencies. However, when the tuition for RAs was added onto the cost of the projects on which they work, that cost would be higher than the savings on benefits—an estimated \$7 million higher. Assuming that MIT-trained PhDs are a national resource that Washington wants to support, it's cheaper for the government to do so through the tuition-benefit mechanism.

Throughout all of this, what President Vest finds particularly frustrating is the government's misplaced priorities. While universities like MIT have squads of federal auditors going over their books in microscopic detail, the process of earmarking—which directly provides fed-

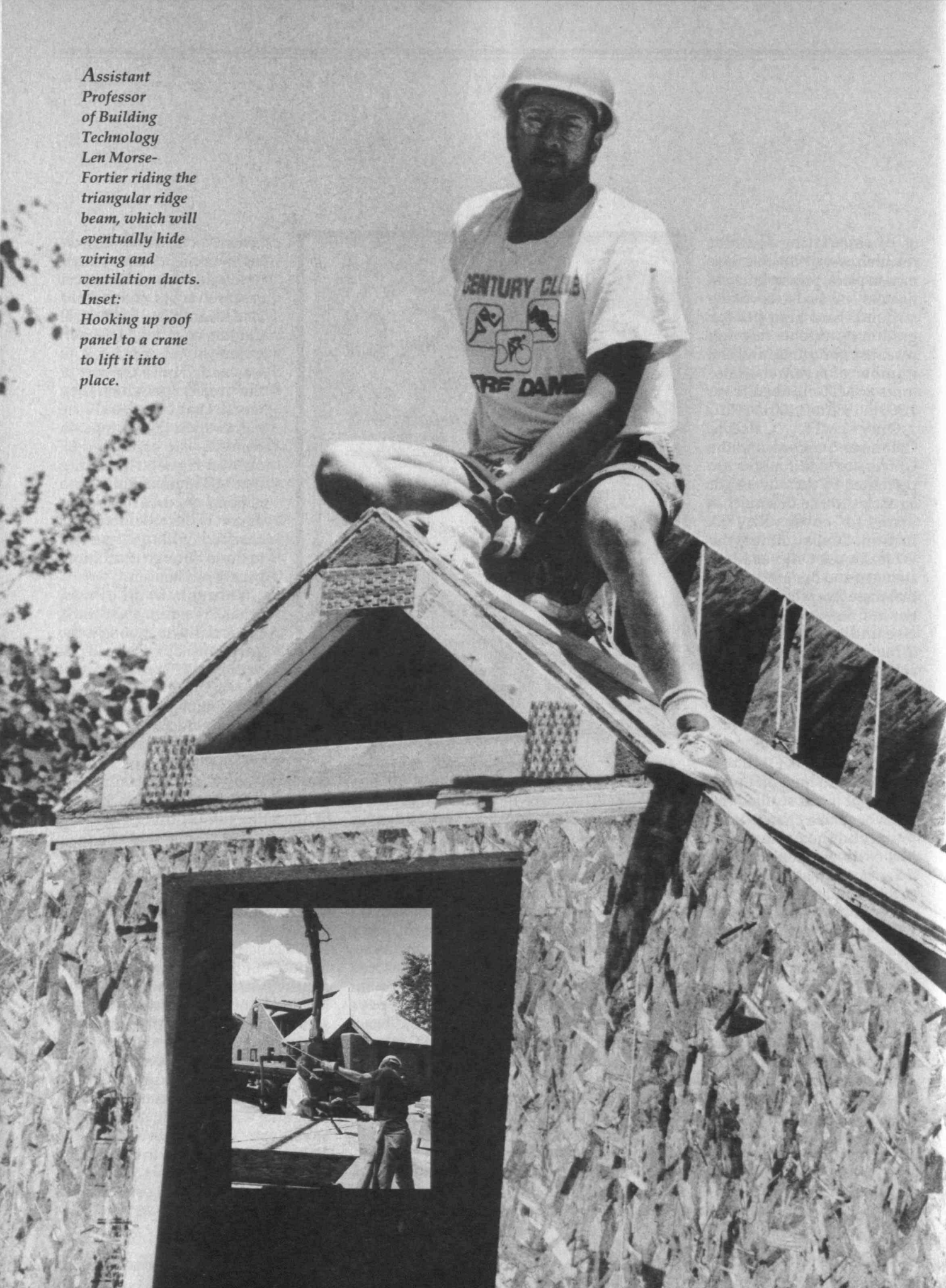
eral funds for academic facilities or programs through legislation, instead of allocating funds through agencies such as NSF which rely on peer review—is rising dramatically.

More funds were allocated to earmarked projects in fiscal 1992 than in the previous five years combined, according to Vest, and estimates for FY'93 range from \$700 million to \$1 billion. "Side by side, we are being attacked for minutiae in the accounting details of indirect cost, and at the same time hundreds of millions of dollars are being given out with no concern whatsoever about their effectiveness," the president says.

"This represents a chaotic approach at just the wrong time in our history," says Vest. "As we move out of the Cold War era, we need to think much more clearly about how we take constrained resources and spend them in an optimal way for the nation." □

Assistant
Professor
of Building
Technology
Len Morse-
Fortier riding the
triangular ridge
beam, which will
eventually hide
wiring and
ventilation ducts.

Inset:
Hooking up roof
panel to a crane
to lift it into
place.



*When
it comes
to finding new
ways of building houses,
MIT's John Crowley has it covered.*

Raising the Roof

BY ANDREW CHAIKIN

This way! Now come down," Research Associate John Crowley, MAR '82—looking not the least bit academic in T-shirt, old gray pants, and work boots—shouts to a crane operator. Dangling from the crane's hook is an 18-foot-long panel, which the operator maneuvers toward a gap in the roof of a small wooden building on the back lot of Acorn Structures in Acton, Mass. As a student perched on the roof's ridge line waits to snare the incoming panel, Crowley watches and, when necessary, calls out more directions. "It's like docking a space ship," he says.

Today, he and his co-workers will complete the roof—for the third time this summer. Crowley's team has been putting up this roof and taking it down, again and again, as part of a test of a new technology that he hopes will revolutionize house construction by making the major components available on a factory-built basis, with no loss in variety.

Crowley is certainly not the first person to introduce advantages of the assembly line to the housing industry. A century ago, prefabricated houses could be ordered from the Sears Roebuck catalogue and were shipped by rail to the new home site. Since the 1930s, companies manufacturing windows, kitchen cabinets, staircases, and



John Crowley laying insulation in roof panels.

the other small components have grown, multiplied, and become more sophisticated in delivering products to the consumer.

But the MIT team is the first to apply a factory approach to the roof, the single biggest component of a house. Not only does the roof exert an often decisive influence on a building's architecture, it's also the single most expensive element. But cutting costs is not Crowley's main goal. He wants to change the way houses are built because there are fewer and fewer people who know how to build them.

"If you look at the long-term picture," Crowley says, "there is definitely a shortage of skilled labor." Some 350,000 construction workers leave the labor force each year. At the same time, the demand for quality is rising among consumers. Just as important, numer-

ous consumer surveys and research results collected by major homebuilders indicate that today's home buyers aren't satisfied to choose from among a few designs in a contractor's catalogue; they want to customize.

One part of the solution, Crowley says, is to shift the bulk of the labor from the housing site to the factory, and that is the underlying purpose of his experiments. With both skill level and availability declining at construction sites, quality control is far more manageable

in the factory. Every aspect of the MIT roof, from materials to manufacturing to distribution to assembly, is designed to reduce on-site labor—without lessening the design flexibility customers want.

Crowley's interest in building houses dates to his undergraduate days studying social change at the University of New Hampshire. There he became interested in the so-called owner-builder movement of the late 1960s and early '70s, which Crowley describes as people taking control of their lives by demystifying the building process. After spending a year working as an instructor at the Shelter Institute in Maine, a school for home building, Crowley found himself heading in a new direction: He decided to pursue a master's degree in architecture and housing technology at MIT.

But it was later, during the four years he spent as manager of R&D for Ryan Homes, an industry leader in factory-built houses, that Crowley saw firsthand the need for better ways to build houses and especially roofs.

Because the housing industry is basically conservative and not known for innovation—unlike its large commercial suppliers—Crowley concluded that the best avenue for change lies in research conducted at universities and funded by private corporations. In 1988 he returned to MIT and inaugurated the Innovative Housing Construction Technology program with a new-technology roof system as its focus. By 1990 the MIT group had secured funding from program sponsors such as Weyerhaeuser, G.E. Plastics, and GAF, among others, for a proof-of-concept experiment.

Last spring, fabrication began at the Acton warehouse of Acorn Structures, a nationwide building contractor and a program advisor. There, Crowley and his team assembled a series of roof sections, each constructed out of ribs in the manner of an airplane wing. The advantage of the ribbed-panel design is that it allows even the most complex roof design to be produced from a relatively small assortment of modular parts, making it easy to customize. Conventional lumber was abandoned in favor of a relatively new material called "oriented strand board," a high-performance version of the particle board often used for inexpensive furniture. Not only is OSB cheaper and stronger than wide-dimension lumber—it's made in a press out of wood strands about 1 inch wide and 2 to 4 inches long—but it can be produced from rapid-growing trees like aspen, poplar, birch, and pine, reducing the need to cut old-growth trees.

A visitor to Acorn would find prototype roof sections spread around the



Len Morse-Fortier, left, and Jordan Dentz, '88, SM '91, using a pneumatic stapler to install blocking in roof panels. The staples serve as support until the special adhesive resin sets.

warehouse in various stages of assembly. At a work table, visiting scholar Michel Parent was squeezing an adhesive out of a pastry-sock-like device. "I'm the French chef of the project," Parent quipped. That adhesive—a special formulation based on resorcinol, a type of adhesive resin commonly used for wood products—is a key component of the MIT roof because it eliminates the need for hammer and nails. And while the Acton warehouse occasionally reverberated with the staccato bang of a pneumatic staple gun, the staples were needed only as clamps while the adhesive cured.

Next to Parent's work area, students were gathered around a half-assembled section, laying out thick yellow strips of fiberglass insulation. The MIT roof comes fully insulated and is finished with a weatherproof coating. With help from Parent and his pastry sock, the students attached the front panel, and the section was finished.

At this experimental stage, the work

went relatively slowly, with interruptions to fix misaligned panels and other glitches. Eventually, Crowley envisions a largely automated assembly line, facilitated by the ability to fully cure the adhesive in just 30 seconds in a large radio-frequency or microwave oven.

The finished roof includes a triangular ridge beam that carries wiring, lighting assemblies, and plumbing, heating, and air conditioning ducts, which means that the MIT roof can accommodate cathedral ceilings where traditional construction offered an attic full of insulation and wiring. Crowley expects consumers to see that opening up the roof volume is a cost-effective way to enhance the spaciousness of houses cramped by rising land prices and shrinking housing lots.

Because it takes less time to build and install, the MIT roof will give builders tighter control over scheduling and production. And for homeowners, it offers not only lower cost, but better finish and better energy efficiency, and it should prove more durable. Thus, Crowley's group will try to market the MIT roof to the housing industry over the next two years. While nothing has advanced beyond the discussion stage, suppliers in the United States, Europe, and Japan have shown interest. Asahi Kasei, a large housing producer in Japan, has a visiting scholar participating in the Innovative Housing Construction Technology program.

"The Japanese want much more individuality in their houses" than traditional Japanese architecture offers, Crowley says. "And they are looking increasingly toward Europe and the United States for images and styles of houses." □

Andrew Chaikin is a Boston-based science writer.



CLASS NOTES

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Our good friend, **Caruthers A. Coleman**, died at the age of 98 on February 5, 1992. He was admired and loved by his classmates and was affectionately known to them as "Dina." He helped to organize and attended most of the class functions and practically all of the five-year reunions as well as the annual reunions which began in 1952 and continued into the early 1980s. His gift for storytelling and his genuine good humor endeared him to his classmates and added greatly to the pleasures of our reunions.

The following excerpts from the February 6 Lexington, Ky., *Herald-Leader* give solid testimony of his extraordinary capabilities as he so generously gave of his time, talent, resources and, most of all, his love in the service of others: "Caruthers Askew Coleman, Sr., played an active role in business and civic affairs in Lexington from the 1920s until the 1990s. . . . He had been involved in several businesses, including real estate, brick manufacturing, mining, construction, and engineering. He had a hand in activities from raising money for charities to helping preserve navigation on the Kentucky River. He was an avid reader, enjoyed traveling, and was generally regarded as a man with much foresight.

"But his favorite community activity was the Lexington Philharmonic. Mr. Coleman was the Philharmonic's chief executive officer for 22 years. He officially stepped down from the post in 1980, but the Philharmonic Board revised its by-laws to create an honorary board chairman position for him. In the final analysis, Caruthers Coleman is Mr. Philharmonic. The success we enjoy today and sometimes take for granted comes because Mr. Coleman provided us with great leadership from our early through middle years," Philharmonic conductor George Zack said. Mr. Coleman underwrote many ventures and parts of projects carried out to benefit the orchestra, he said.

"... Mr. Coleman was born August 19, 1893 in Panola County, Miss. He graduated from the New Mexico Military Institute in Roswell, N.M., in 1911 and received a degree in engineering from MIT. He was an Army captain during World War I. Mr. Coleman helped plan and organize the Lexington Industrial Foundation in the 1950s and served as chairman of the group, which was instrumental in attracting many industries to Lexington in the 1950s and 1960s. Also in the 1950s, he was president of the Kentucky River Development Association, which was credited with preserving navigation on the river. He also served a stint as president of the local chamber of commerce. He was appointed to the Fayette Board of Education in 1956 and resigned in 1966. . . . He worked on behalf of Transylvania University for many years, beginning in the early 1950s. . . . as a member of the Transylvania Board of Curators in 1954 and later a member of its Executive Committee. Later he was named a life member of the Board. . . . Mr. Coleman also was instrumental in developing the services of the United Cerebral Palsy of the Blue Grass and had served as president of that organization. He had been a member of the United Community Fund Board and participated in the St. Joseph Hospital Building Fund Drive in the 1950s. . . . Soon after he turned 90, he said when asked the secret of long life: 'One thing is to have good genes. Then I don't ever worry about something I can't change—business, politics, or whatever. It's no strain to concentrate on what you

can do. But trying to stay awake at night to solve an impossible problem, or one that's beyond your ability, is what ages people."

The news article enumerated several community awards that Dina received throughout his life and many personal tributes by others: "a very reliable, dedicated person" . . . "a many-faceted, modest man who was always committed to high quality" . . . "a true gentleman whose gentle nature and charitable heart will be sorely missed and long-remembered."

What an example to follow for those of us who have been blessed with a wonderful education and talent. Dina was special and will be long-remembered. The benefits from his energies will continue for many years after most of us are gone. Well done, good and faithful servant!—**Bob O'Brien**, acting secretary, 25 Keith Rd., Pocasset, MA 02559

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Unfortunately, the only news I can report this month is the passing a year ago (April 1991) of Professor **William MacAdam's** widow, Jean. I am sure you all will recall that not only was she a 1917 wife, but her father was Carbon P. Dubbs in whose name she, her brother Carbon C. Dubbs, '35, and **Bill MacAdams** established in 1965 the Carbon P. Dubbs Professorship in Chemical Engineering.—**Don Severance**, acting secretary, 39 Hampshire Rd., Wellesley, MA 02181

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Somehow a letter from **Herb Lerner** about a year ago never saw the light of day in this column. He had sent an obituary from *The Star-Democrat* which reported that his daughter, Sally L. Will, died March 4, 1991, at her home in Easton, Md. My apologies, and our sympathy to Herb at this late date.

Recently, Herb sent me a copy of a letter he wrote to the editor of the *Wall Street Journal* on January 29 recommending a campaign to draft General Norman Schwarzkopf, "a genuine heavyweight contender," because America needs a leader whose "track record is unimpeachable." Herb feels that "the United States will go down the drain if something right isn't done soon."—**Max Seltzer**, secretary, 865 Central Ave., Needham, MA 02192

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We regret to report the death of **Albert A. Morse** on January 6, 1992. He took Course 7 at the Institute. His death was reported by his son Kenneth J. Morse. Our class publication, *25 Years After*, has his picture and a record of his occupation at the time as an engineer with the municipality of Newton, Mass. We have written to his son to inquire if he could find an obituary which we might use to record his career in a future issue.

I called **Douglas M. Burckett** on the telephone and found that he was at work in his office. I reached him there and we had a pleasant conversation. He is well and was glad I called him.

I telephoned our class president, **Douglas D. Way**, and found him at home. He had a medical problem recently but fortunately the news is good. We all have to keep well enough to attend our next

class reunion, remember?—**W.O. Langille**, secretary, P.O. Box 144, Gladstone, NJ 07934, (908) 234-0690

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Please send news for this column to: **Harold Bugbee**, secretary, 313 Country Club Heights, Woburn, MA 01801

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Class President **Cac Clarke** was in conversation with **Bill Sherry** of Tulsa, Okla., a couple of months ago and learned that Bill had practically retired from his oil business. Bill showed up at several of our five-year reunions.

We were informed of two deaths this month: **Edward W. Haywood** of Braintree, Mass., on August 9, 1991; and **Edward P. Clark** of Damariscotta, Me., on March 3, 1992. Ed Haywood worked with the U.S. Signal Co. and the Westinghouse Corp. before he served for 30 years with the Monsanto Co. Ed Clark was a World War I veteran and served as captain of the Rhode Island National Guard 118th engineers. He worked with the New Jersey division of New York Telephone Co. for a while after graduation and then entered the family business, the former Edward Darkinson Mfg. Co. Your secretary knew both of these men well in undergraduate days.—**Sumner Hayward**, secretary, Wellspring House E64, Washington Ave. Ext., Albany, NY 12203; **Samuel Lunden**, assistant secretary, 6205 Via Colinita, Rancho Palos Verdes, CA 90274

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Yardley Chittick

It is with deep regret that I must report that **Yardley Chittick**, our class secretary for many years has been asked to be released from his post. Our warmest thanks to him for his faithful service.

The task has now fallen into my hands, and I'll do my best to follow in his footsteps—a tough job!

Yes, as is inevitable, we are losing our classmates: **Van Dorn C. Smith**, November 16, 1990; Mrs. **Edward L. Bowles** (Lois), June 4, 1991; **Eastman Smith**, September 18, 1991; Mrs. **Thomas H. West** (Priscilla), September 30, 1991; and **Richard B. Oakes**, November 4, 1991.

Though there are few of us who are going to make it to our 70th Reunion, we will take time to



Presented to Luis A. Ferre, '24 (center), former governor of Puerto Rico and life member emeritus of the MIT Corporation: the Presidential Medal of Freedom. President George Bush bestowed the nation's highest civilian honor on Ferre, one of ten men and women to receive this award, at the White House last November.

The citation reads: "Luis A. Ferre has led the people of Puerto Rico as a dedicated public servant, visionary industrialist, and patron of the arts. Over the course of his life, he has been

involved in the family business, newspaper publishing, and university development. He also built and donated Ponce's Museum of Art and free public library. Later, the people of Puerto Rico elected him, the founder and head of the New Progressive Party, their governor.

"Luis Ferre equates business success with social responsibility and describes himself as 'revolutionary in idea, liberal in my objectives, and conservative in my methods.' The United States honors one of our pioneers of freedom."

remember those of us who are no longer with us. We miss them!

Should my classmates have any news to report, please contact your new secretary: **Martha E. (Eiseman) Munzer**, secretary, 4411 Tradewinds Ave. E., Lauderdale-by-the-Sea, FL 33308, (305) 492-8121

23 70th Reunion

As I return to presenting notes to our class I am reminded of the butcher who turned around and accidentally backed into the machine for grinding meat and got a little behind in his work. Your scribe is way behind in his class notes. The reason was a sudden heart attack, resulting in a midnight ride to the hospital in an ambulance, a bout with a severe flu-type cold, and a bleeding ulcer, in that order. As a result we must catch up with some notes being old.

A while back the annual list of class members was received from Diana Strange, senior associate director of Alumni/ae Activities. Membership has dropped off slightly, but there are about 115 toughies to carry on our activities. Incidentally, bear in mind that next year will be our 70th. Our president started planning a year ago, and in his first call for financial assistance he was disappointed that only class officers had responded.

Come on fellows, pony up. You wouldn't want to see your president in jail for not paying the bills. MIT president Charles Vest accepted an invitation to one of our dinners. It wouldn't be right to ask him to pay for his dinner, would it?

Another reason for being tardy on notes is that Winnie and I moved from a large house to a ranch type and let me tell you, if you're contemplating moving—don't. I don't think we will be settled until the fourth of July. The only classmates I have seen this year are Merriam and Dave Joy. . . . Communications have been received from Mary and Royal Sterling. Some time ago they both were having eye trouble—implants and so on. I presume results have been satisfactory. No results have been reported on his business of building cocktail tables. If you are in need of one, give him a call. . . . Dick Frazier's wife, Elizabeth, writes to tell me that her book is now on the market. The book is *Stevan*, and it is written under the name Elizabeth Howland. . . . Regina, wife of Jerry Fitzgerald, whom you may know is deceased, called a short time ago. She lives in Lakeville, Conn., and had planned to come into Hartford, hoping my wife and I might accompany her to a stage play. Unfortunately, the weather turned bad and we did not meet. She reported she was in good health.

We now must call your attention to the reports of three classmates who have left us. . . . **Edwin O. Wilson** died May 21, 1991. He was born in

Springfield, Iowa, in 1897. He received an A.B. from the University of California in 1920 and an S.M. in chemical engineering practice in 1923 from MIT. Edwin married Helene Cleary of Everett, Wash., but we have no record of any family. In 1931 he was associated with Proctor and Gamble Co. in Cincinnati and later became owner of the Pacific Chemical Products Company of Everett, Wash. He was also a veteran of World Wars I and II and a fellow of the Society of Antiquaries of Edinburgh, Scotland. For hobbies he spent 35 years as a piper in the Washington Scottish Pipe Band, operated a metalwork lathe, and studied the archaeology of the white man and also the Roman Imperial Army.

Thomas F. Richardson died September 5, 1991, in Monadnock Community Hospital, Peterborough, N.H. He was 96. Born in Raleigh, Miss., he graduated from Mississippi College, attended MIT, and later received an S.M. at Yale University. It is said he was the last surviving U.S. marine veteran in New Hampshire who served in France during World War I. After his ship survived a German torpedo attack in 1918, he saw action in Chateau-Thierry and Belleau Wood. Thomas later joined the New Haven, Conn., public school system, teaching history in high school and rising to head of the History Department. He was also president of the Connecticut Education Association. Upon retiring, he spent 10 years researching his family history. He married Pearl Lydia Harlow and had three children,

twelve grandchildren, and nine great-grandchildren.

Robert Chapman Sprague, one of the most prominent men to graduate in our class, died September 7, 1991, at his home in Williamstown, Mass. He graduated from the U.S. Naval Academy and received an S.M. in naval architecture from MIT. While serving in the navy he invented tone control for radio. In 1926 he founded Sprague Electric Co. in Williamstown and served as president until 1953. He was CEO and honorary chair until his death. His legendary honors and positions are far too many to list here. He was elected to the MIT Corp. in 1953, becoming a life member two years later. He served on numerous committees and boards at the Institute and chaired many. He was connected with the Sloan School, ocean engineering, electrical engineering, computer science, and innumerable others, and became a Life Member Emeritus in 1975. He received several honorary degrees and was also a fellow of the IEEE and the Academy of Arts and Sciences. He married Florence Antoinette Van Zelm of New Rochelle, N.Y. and they had two grown sons, eight grandchildren, and eight great-grandchildren.—**Frederick O.A. Almquist**, secretary, 19 Griswold Rd., Wethersfield, CT 06109

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Mrs. Caro Shugg Curran sent a clipping of her father's obituary from the *New York Times* to the Alumni/ae Association. He died in his home January 23, 1992. The *Times* headline, "**Carleton Shugg**, 92, an Innovator in Submarines for Four Decades," set the tone of the obituary for this accomplished alumnus.

"Mr. Shugg worked for the U.S. Navy, served as general manager of the Atomic Energy Commission, and was president of General Dynamics' Electric Boat Division in Groton, Conn. He graduated from the U.S. Naval Academy in 1921 and earned a master's degree in engineering at MIT in 1924. He helped invent the rescue diving bell and designed a 110-foot water-filled tower in which thousands of sailors practiced underwater escape. He pioneered in the use of welded submarine hulls, and invented a mechanism to rapidly close watertight doors.

"Leaving the Navy in 1929 with the rank of lieutenant commander, he became the general manager of Sprague Electric Co. in North Adams, Mass. When World War II broke out, he resumed shipbuilding as general manager of the Cramp Shipyard in Philadelphia and the Todd Shipyards in Hoboken and Brooklyn, N.Y.

"After a brief stint as general manager of the Hanford plutonium works in Washington, in 1948 he became the Atomic Energy Commission's deputy general manager, acting director of reactor development, and later acting general manager. He put Hyman G. Rickover, then a captain, in charge of a new Navy project on nuclear propulsion. Joining Electric Boat in 1951, Mr. Shugg worked with Mr. Rickover in developing the first nuclear submarine, and its more sophisticated successors."

Carleton helped build the first missile in the Polaris program, which earned him the Navy's highest award. He retired in 1965. He is survived by two daughters, a son, seven grandchildren, and twelve great-grandchildren. An alumnus who contributed so much will be missed by many.

We have learned of the death of **E. Curtis Plant**, 90, on December 31, 1991. He is survived by a son and three grandchildren. He had been an electrical engineer for the Public Service Electric & Gas Co. in Newark, N.J., for 47 years. He was a member and on the board of trustees of Christ Hospital and the Boys' club of Jersey City. He was a former member of the board of directors of the Statewide Savings Bank, past president of the University Club, and a past president of the board of trustees of the Lincoln Association, all of Jersey City. All my condolences to the family.

In April, Col. Stern called 95-year-old **Jimmy Doolittle** in Sacramento, Calif., to renew

congratulations to him on the 50th anniversary of the heroic bombing mission to Japan by "Doolittle's Raiders," for which he was commanding officer.

In the last two issues of *Technology Review* I have had nothing to report. I believe this column should make up for that. I would love to hear from any and all.—Co-secretaries: **Katty Hereford**, Box 5297, Carmel, CA 93921; **Col. I. Henry Stern**, 2840 S. Ocean, #514, Palm Beach, FL 33480

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A telephone call from **Arthur "Gus" Hall** in Wauwatosa, Wis., proves Gus is still right on the ball. He sounded fine but reported he has eye problems that reduce his reading to a minimum. . . . A letter from **Fred Greer** says that he and Eleanor are in a very nice nursing home—Aynsley Place at 80 Lake St. in Nashua, N.H. Both of them have severe glaucoma and have lost most of their sight.

The passing of one classmate must be reported. **Charles B. Weiler** died on December 23, 1991, at the Brandywine Hospital near his home in Christiana, Pa. He was employed for many years as sales engineer at John's Manville of New York. Charles is survived by two sisters.—**F. Leroy "Doc" Foster**, secretary, 434 Old Comers Rd., P.O. Box 331, North Chatham, MA 02650

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Phoebe and Dale DuVall of Deltona, Fla., wrote to give an update on their view of current events. Guess they're as frustrated as the rest of us. . . . Received a very nice letter from **Stanley Fischer**, professor of economics at MIT, thanking our class for making his appointment as the Elizabeth and James Killian 1926 Professor. He notes that "the chair brings both honor and research funding that will make it easier to pursue new ideas and areas of interest, and I am very grateful for both." After an update on his career, he closes with, "It's sobering to realize that I first came to MIT more than half my lifetime ago. My career has been immeasurably enhanced by my good fortune in choosing the right graduate school and right colleagues, and now by this unexpected honor. Thank you."

We have a number of classmates who have left us since the last issue. Though many have lived illustrious lives, we can only do a brief review on these pages. . . . **Esther Parsons Brabson**, who graduated with a degree in architecture, died January 5, 1992. After two years as instrumental founder of the Architectural Library at MIT, she went to work for *House Beautiful* magazine. Following her marriage to **Army Colonel Fay W. Brabson**, her lifetime career became that of an officer's wife. They had two daughters and a son. Later the colonel became head of the History Department at the Staunton Military Academy. Upon retirement, Esther became editor, counselor, and adviser on the writing of the colonel's biography, *Andrew Johnson—The Right Course*. They lived in Washington, D.C., from 1968, and nine years after his death she moved to Maryland with her daughter's family. In 1985 she moved to a retirement home in D.C., developing Alzheimer's disease in 1987. She was buried at Arlington Cemetery with her husband.

Alfred W. French, Jr., of Piqua, Ohio, and Naples, Fla. died January 7, 1992, at Naples. He is survived by a son, **Alfred W. French**, class of '63.

Donald S. Nelson of Dallas, a world-famous architect, died January 4, 1992. He was the youngest and the first MIT person to win the Paris Prize in Architecture. After MIT he did graduate study at Ecole Nationale Supérieure des Beaux Arts in Paris. He was a member of the architectural and planning firm Bennett, Parsons, and Frost in Chicago. He designed the Texas Centennial and 24 federal memorials throughout Texas, as well as the Mercantile National Bank in Dallas. After military service he formed the architectural firm of Broad and Nelson. They designed the Grand Lodge Temple in Waco, Tex., the Merchants Bank

Complex in Dallas, the Dallas Love Field Terminal Building, Dallas County Government Center, the parking garage under the Kennedy Memorial, Dallas, and the Lee Lockwood Scottish Rite Library and Museum in Waco, among others. Donald was made a fellow of the American Institute of Architects in 1954. He served in many other professional capacities. Buildings for which he received awards and prizes included the Benjamin Franklin High School, Bishop Dunne High School, and the Memorial Hospital of Garland, Tex. For his accomplishments he was listed in *Who's Who in America* in 1972-73. He was preceded in death by his wife of 54 years in 1984, and is survived by a brother and son.

Keep sending your letters and articles so I'll have something to report.—**Donald S. Cunningham**, secretary, Eventide, 215 Adams St., Quincy, MA 02169, (617) 328-1840

27

Maurice James has received a further award since our report in the April issue. He was honored by Gov. Gregg as New Hampshire's 1992 Outstanding Tree Farmer. In 1948, he became the fifth generation to inherit the James Farm in Northwood. Maury has worked to maintain and improve 100 acres of woodland with assistance of foresters. It became a Certified Tree Farm in 1961 and has remained a member of the American Tree Farm System.

Maury retired as administrative manager of international operations of Bucyrus-Erie Co. in 1970. Until his wife died in 1989, they travelled extensively abroad. He kept his commission after ROTC with the Corps of Engineers and saw active duty in World War II. He retired as lieutenant colonel in 1967.

Dwight M. Moore of Cypress, Calif., died on September 25, 1991. He was a mechanical engineer. . . . **Frederick W. Willcutt** of Washington, D.C., died on November 24, 1991. After receiving an MS in electrical engineering, he moved in 1932 to Washington and worked for the Potomac Electric Power Co. He was manager of its System Planning Division when he retired in 1971. During World War II he served in the Marine Corps in the Pacific. He retired as lieutenant colonel in 1966. Fred was a life member of IEEE, the Congressional Country Club, an elder of the Chevy Chase Presbyterian Church, and a member of the MIT Club of Washington. He enjoyed many class reunions.

Alden G. Reed of Woodburn, Oregon, died on December 29, 1991. This comes from a brief note from his wife, Miriam. . . . **Ernest C. Hinck, Jr.**, of Roanoke, Va., formerly of Montclair, N.J., died on February 10, 1992. After receiving a degree in electrical engineering from MIT, he earned a law degree from Rutgers University. He was president of Church St. Inc., a building of offices, stores, a theatre, and a restaurant. He was a member of the Illuminating Engineers Society and the Professional Engineering Society of New Jersey.

His daughter **Karen McKergow** wrote that he was looking forward to celebrating our 65th Reunion.

John H. Weaver of Rochester, N.H., formerly from Portsmouth, died on March 2, 1992. An electrical engineer, he joined the Stone & Webster Engineering Co. as an electrical designer. He continued with the company throughout his career and retired in 1968 to Portsmouth.

We offer our sympathy to the widows and family members of these many classmates.

—**Joseph C. Burley**, secretary, 1 Harbourside Dr., Delray Beach, FL 33483; **Lawrence B. Grew**, assistant secretary, 21 Yowago Ave., Branford CT 06405

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When you receive this issue of the *Review*, it will be just one year until our 65th Reunion, perhaps the last official gathering of our class as a unit. While there have been many declarations of intention from members, it is too early for firm plans,

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although we will soon have preliminaries. Reliance on the experience and expertise of our Alumni/ae Association personnel will be necessary, but it will help to have comments or suggestions from you to our Reunion Committee Chair **Herman S. Swartz** (12 Minola Rd., Lexington, MA 02173), our Class Agent **George P. Palo** (211 N.W. 2nd St., Apt. 1302, Rochester, MN 55901), or your secretary. We have had exemplary reunions through the past 65 years and this one should have great meaning.

Statistics of our class membership are pertinent to our situation but difficult to analyze for any particular purpose. The *Freshman Gray Book* of fall 1924 shows a membership of 507 in listing and group pictures. But when we graduated in June 1928, the *Technique* showed a membership of 534 in individual pictures and list in spite of extensive attrition through the four undergraduate years, with offsetting gains by transfers. Then, in our 50th Anniversary Reunion book of 1978, the list of classmates (undergraduate and graduate) living, deceased, and whereabouts unknown totaled 914. Lastly, a 1991 list of 1928 graduates still living totaled 133, a robust lot of survivors of the original 534—25 percent after 64 years. That should be enough "good makings" for our 65th, along with those of all the other categories of affiliates. Let us hear from you.

We are proud to report the endowment of a Graduate Fellowship in Environmental Engineering by **Morris H. Klegerman**. Morris had an outstanding career with Alexander Potter Associates of New York, later combined with Camp, Dresser & McKee of Cambridge in environmental engineering. Under his leadership, these companies engaged in worldwide environmental problems far beyond their sanitary engineering beginnings.

We have no knowledge of deaths of classmates for this issue, though we are advised of the death of Judith, widow of Dr. **Benjamin F. Miller**, who died on June 28, 1971, and of Ruth, wife of **Claude H. Rice**.—**Ernest H. Knight**, secretary, Box 98, Raymond, ME 04071

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George J. Myers, Jr., of Wyoming, Pa., has sent me a year-end summary of events: "As many of you who receive this letter know, Barbara died September 5, 1991, being stricken on July 9 with an aneurism. There followed complications which truly heroic efforts to save her could not overcome. Her death was exactly two weeks short of our 55th wedding anniversary. The blessings given us were beyond count. Among them were the prayers of support we both received during her illness and the love which enveloped her. I still feel this support. During recent days, I have been involved with business and deadlines which must be attended to. Hence, I have not been able to acknowledge the cards, flowers, church, and arthritis foundation gifts in Barbara's memory, and help from loving friends. Please accept this Christmas letter as my expression of thanks and gratitude."

A note comes from the wife of **Edwin R. Gardner** of Pinellas Park, Fla., "I am sorry to tell you that Ed has not been well since his 1983 stroke. He is now in a nursing home and I fear that he has only a few weeks to live. He wishes the best for all his classmates."

Jackson H. Emery of Norristown, Pa., writes, "I am now 88 years old and I am living in a personal care unit called Senior Suites. Since my knees gave out I must use a walker to get around. All my grandchildren are college graduates. Originally, I was in the Class of 1927, but due to illness I was out of school for a year. I was a member of the 1927 freshman crew."

Received a note from **Earle Erickson** and wife, Marion, of Burlingame, Calif. "Marion and I are doing as well as can be expected. I am 86 years old now. . . . I manage to keep busy with many troubles, one of which is gardening which is getting difficult because of water shortages and restrictions in this area. . . . Our 65th Reunion is getting nearer! Best

wishes to all."

Sam Shaffer of Los Angeles, Calif., writes, ". . . I am looking forward to attending our 65th Reunion, two years to go. I am glad to say my health is OK, for which I am grateful. With best wishes to you both and our classmates."

A note from **Jonathan F. McCray** (wife, Isabel) from Bel Air, Md., had a pleasant surprise while visiting Puerto Rico with his wife and her sister over the Christmas holidays. He had hired an English speaking cab driver to give a tour of the countryside including Ponce which he remembered from Stone and Webster days. He writes, "The cab driver suggested that we visit the art museum which was built by a former governor of Puerto Rico and donated to the city of Ponce. While visiting the museum, the cab driver came to me and said that the former governor who had built the Museum was there and would like to meet him. I replied that we would be delighted to meet him. During our conversations with the former governor, whose name is Luis Ferre, I complimented him for his use of the English language. He replied that he should, he graduated from MIT in Cambridge. I asked him what year, he said he was in Class of 1924. What a small world!"

I have a great surprise for you! Recently I received an interesting note from a female member of our class. Her name is **Constance Sharp Sammis** of Newport Beach, Calif. She writes, "For years I have enjoyed receiving your birthday greetings from the Class of '29 and read your class notes in the *Review* and mentally sent you many 'thank yous.' Please accept them now! Though Ford and I only had two sons, at present I have 12 grandchildren (including three sons-in-laws) and six beautiful great-grandchildren all near me in Orange and San Diego counties. What blessings! As a very young girl (and one who earned her way with the help of scholarships) I found MIT challenging. But I have been increasingly grateful as the years go by for the way MIT taught me to approach a problem, research it, and try to find a solution. When my elder son was in college I took a master's at UCLA in journalism, when I needed to earn a living, at age 50, I found my degrees from MIT and UCLA to be wonderful door openers to job interviews. Before that time, I had jobs in chemistry as assistant to Arnold Beekman of PhD fame and others. But writing became my great interest and for many years I taught writing and worked as a columnist (*Christian Science Monitor*). I am still teaching and editing quite actively. Sorry I have not been to any of our reunions except our 25th. But I think of and speak of MIT very often with admiration with people with whom I come in contact." Besides her talents, she has an eye for business enterprises. With her note to me as class secretary, she sent me a pamphlet, an introduction to "The Writer's Workshop," where she has a staff of four or five instructors who render services to would-be authors, editing, teaching "how to expand a few sentences into a full length article or stories."

I regret to announce the deaths of: Mrs. **Austin Norcross**, Newton, Mass., on July 30, 1990; and **N. Hanson Ball** of Annapolis, Md., on December 13, 1991. **Norman Hanson Ball**, 84, Annapolis resident for 56 years, died at Anne Arundel Medical Center after a brief illness. He was born in Swarthmore, Pa., and received a degree in mathematics from MIT. For two years, he was on staff at the Institute of Advanced Studies in Princeton, N.J. He joined the civilian faculty of the Naval Academy in 1935 as instructor in the department of mathematics and retired as full professor in 1968.—**Karnig S. Dinjian**, secretary, P.O. Box 83, Arlington, MA 02174, (407) 395-2890

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From time to time I send birthday cards to classmates in an effort to elicit items for class notes. This month these birthday greetings have generated two responses, one from **Bob Poisson** and the other from **Paul Wang**.

Bob spent much of his career in the textile industry, working for a time for Riegel Textile and prior to his 1968 retirement as marketing VP of Borg Fabrics. Since his retirement, he and his wife have lived in Essex, Conn. In the early years of Bob's retirement, he acquired a proprietary interest in a yacht brokerage business that operated under the name Northrop and Johnson of Essex, but he says he is no longer in the boat business. He described Essex as "a delightful place where we can enjoy friends, boating, etc. . . . may it last for many more years!" Bob reports having recently seen **Frank Nettleton**, who is a fellow resident of Essex.

Paul Wang spent much of his career working in the aircraft industry as an acoustics expert for such companies as Douglas and Northrup. He also taught in China for a time. He reports that he has "rejoined the work force, so to speak, since coming out of retirement about five years ago, mostly for the fun of doing it." He has been using his acoustics expertise by working with the environmental management group of Orange County, Calif. Paul and wife, Margaret, live in Mission Viejo, Calif., and "like to travel the easy way, mostly cruising. Between work, travel, and family, we're kept busy. However, we always have time for friends and classmates who may be coming our way."

From **Bill Waite** we have an entertaining description of a trip from the Bangor Station of the Chemical Engineering Practice School to the top of Mt. Katahdin made in August 1930. The group of 17 hikers included **Bill, Greg Smith, and Stan Wells**, plus three MIT staff members—**Doc Lewis, Bill Ryan** (then head of the Practice School), and **Charlie Cooper** (then Bangor Station manager). Unfortunately, space does not permit a full account, but I would be glad to send a photocopy of Bill's letter to anybody who would like one.

In recent years I have found that in cases where classmates are disabled widowers, it is the daughter-in-law rather than the son who responds to my requests for information. This month's "d-in-l" letter is from **Dorothy Brown**, who reports that her father-in-law, **Harold Brown**, has been in a nursing home for about two years and that his "recent memory is non-existent," although he can remember some things that happened at MIT. Since Harold has never responded to any of my letters, Dorothy's letter is especially interesting. After graduate studies at Columbia University, Harold worked with **Allan B. Durant** and **William P. Lear** in the early days of radio and television and was the inventor of the "Q" vibrator, manufactured by P.R. Mallory & Co., which made possible the widespread use of car radios in the late 1930s. He later worked at the Naval Avionics Facility in Indianapolis and at **Lorain Products Co.** in Lorain, Ohio, until his retirement in 1987. He was awarded almost 50 U.S. patents. Dorothy's husband, **James**, is MIT '59, and her father is **John Swanton**, former associate class secretary of the Class of '31. Harold's granddaughter **Alice** followed her father and both grandfathers to MIT and graduated in the Class of '86. Grandson **Nathaniel** may soon follow suit.

Daughter **Natalie Sherman** has notified us that **Jack Jarosh** died after a long illness on December 1, 1991. Unfortunately I do not have much information about his career, other than that he worked for **Hughes Aircraft** in Culver City in the 1960s. He was living in a Long Beach, Calif., rest home at the time of his death. . . . We also have a notice that **Jack Latham's** wife, **Ruth**, died last February after a long illness. Those who regularly attend class reunions will remember her as a gracious and friendly lady who accompanied Jack to many of them, both before and after his term as class president. She was also the matriarch of a family of four children, fifteen grandchildren, and five great-grandchildren, several of whom hold MIT degrees.—**Gordon K. Lister**, secretary, 294-B Heritage Village, Southbury, CT 06488

31

This month starts with a note from **Ed Hubbard**, which I thought you should all read since it

concerns something of which we can all be proud.

"On June 7, 1991, at the Annual Alumni/ae Luncheon, an announcement was made that the 60th Reunion Class of 1931 had raised a 60th Year Class Gift of \$2,973,000. Our class responded enthusiastically to Gift Chair **Ken Jamieson's** bold concept, tireless efforts, and final accomplishment toward his announced goal of \$3 million.

"Subscription books closed for the Gift on Alumni/ae Day, but please read on. . . . **John Swanton** concluded his long and arduous service as class agent—always there, always cheerful, and always helping to keep us informed of class news. Opening 1992, John turned in \$29,000 for July 1991. That makes \$3,002,000 in our records.

"Again, my successorship to this performance covers September through December 1991. Your gifts in those months, which are being gratefully acknowledged in this letter, totaled \$106,000. What is even more encouraging is that a higher than ever percentage of our living class gave in 1991! Keep 'em coming, girls and boys!"

Also a note from **John Swanton**, which contains a number of surprises.

"After the great days of fellowship at our 60th, Louise and I retreated to our Westport Island home in Maine, now an annex to the main house, which has been passed on to son and family. The depression that plagued me throughout the reunion continued, in spite of all the new medicines, until late August, the day of the hurricane. Louise drove me to a hospital in Boston, where after six treatments the depression was all over and I've been as good as new ever since. I tell all this because I want you to know that depression is treatable. Shock treatments got me through my early career, then lithium helped me for many years.

"A landmark of the summer was getting our 1965 Lyman professionally painted for the first time, from black to white. . . . **Joe Buswell** got to Maine and had interesting things to tell us—a new wife plus travel and cruises all over the world.

"We came back to Newton from Westport as usual November 1. I broke my right arm on my own staircase, but it healed pretty well without any fancy surgery."

At any rate, John was well enough to make a trip with Louise to Bonita Springs, Fla., in January to comfort his widowed daughter.

This note, being written in March, reminds me of where I was just over 50 years ago. After a terminal leave at the end of November, I was called back in early December to the 35th C Engineers, which was then at Camp Robinson, Ark. We were shipped to Camp Ord in California, arriving on Christmas Day. We obtained all the proper clothing for being shipped to the Pacific, but in February the orders were changed and we were issued long underwear and fur hats for Fort Nelson, British Columbia. (It had one of the airfields on the air route to Fairbanks, Alaska.) At that time there were no highways from the states to Alaska, and there was no way to service the airfields between Fort St. John and Fairbanks overland. We had to be in Fort Nelson with all our equipment and supplies before the frost came out of the ground, so we bulldozed a trail. Ice broke on the Tetsa River south of Nelson on April 5 and were "in."

As soon as it warmed enough to work the ground, we started west toward another airfield at Watson Lake—constructing a pioneer road, building bridges, clearing forest, corduroying wet ground, and going over or around the mountainous territory along the way. We almost made it to Watson Lake—about 305 miles before we met the 128th Engineers on September 25, who had built the required pioneer road south and east from Whitehorse, Yukon Territory—the final connection.

Hope to see what it is like now—they are having celebrations all along the route this fall and I have been buried in mail promotions.

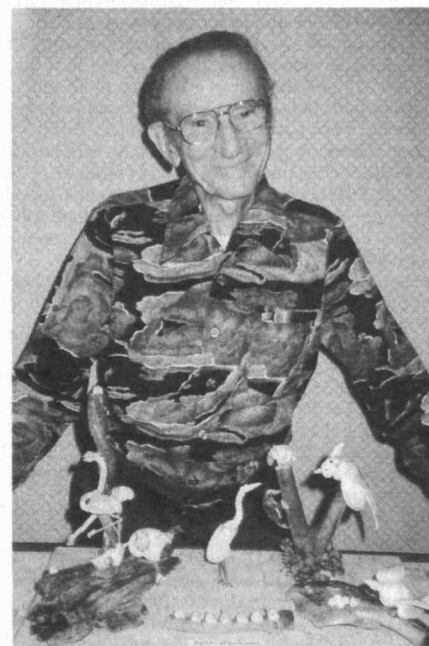
Winslow H. Hartford (Class of '30 and retired professor at MIT) sent a letter detailing much more about **Alfred Ziegler**. This comes from the remarkable symbiosis between Troop 1, Newtonville, Mass., its scoutmaster during our undergraduate days, **Douglas Sloane**, and the

Institute. We have identified 11 MIT men, from **Ben Margolin** ('27) to **Clint Tylee** ('39), and including **Bob Kinraide**, all members of this remarkable troop. **Joe Keithley** ('37) has been the most active in alumni/ae affairs.

During his graduate years, Al was instrumental in funding a "Sunday Evening Club" at Central Church in Newtonville. This attracted the likes of **Karl Compton**, **Fred Morris**, **Tubby Rogers**, "Profanity Bill" **Greene**, and other MIT celebrities as speakers, as well as MIT students and alumni, of whom I remember **Bill Bachli**, **Werner Bachli** ('33), and **Howard Huntress**. The SEC provided dates for dances at Walker, which, this being Depression times, we developed an elaborate technology for crashing.

After World War II, and for the rest of his life, Al kept this group together in the service of the Cathedral of the Pines in Rindge, N.H., founded by **Douglas Sloane** as an interfaith memorial to American war dead in memory of his son, **Sanderson**, who died flying a mission over Germany. Al had been a longtime member of the Cathedral's board of trustees and was also chair. He organized a Troop 1 Memorial Fund in memory of its deceased Scouts. Al also served in the Army from 1943 to 1946 as a lieutenant. Thanks to Professor **Hartford** for informing us further of Al's lifelong good works.—**Wyman P. Boynton**, secretary, 668 Middle St., Portsmouth, NH 03801

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Jacob Millman died in May 1991. In my written obituary I highlighted his 23 years of teaching at Columbia and his textbooks on electronics, physics, and computer science. He inspired countless students over the years. His maxims, "What I have told you here is the gospel truth, subject to these approximations," and "Knowing the answer, I can draw the circuit," will be long remembered. I recently received a beautiful tribute of a son to his father from **Jeffrey Millman**, which I shall quote in part.

"There was another facet to his life that developed only after his retirement to Longboat Key, Fla. He became intrigued with the sea shells he found during his walks on the beach. Being the scientist he was, he needed a reason for the collection. So he began fitting the shells together and studying shell sculpting—his works actually being shown at various museums around the area. His shell sculptures reflected the same painstaking attention to detail that was characteristic of his

textbooks. Never would I have imagined that someone as immersed in the engineering discipline as my father could have made such a complete and wholeheartedly enjoyable transition to the field of art. It is a testimony that you need not have the 'credentials' to do something, just the desire. My dad turned that interest into a 12-year endeavor that provided pleasure to many people." Jacob's shell sculptures were displayed in our memorabilia room during our 60th Reunion.

One of our classmates, **Lawrence Berk** (formerly Berkowitz), made a big success in an unusual field, especially for an MIT graduate. He founded the Berklee College of Music. It started out as a one-of-a-kind trade school that focused on the music of the day. It kept up with the ever-changing world of music and today has 2,700 students from all over the world. Lawrence worked as a pianist while attending high school, but had initially decided against a life in music. He graduated as an architectural engineer in 1932, but since the Depression was at its worst, he decided to make music his career. He has influenced and helped many well-known musicians.

Our classmate Rear Admiral **L.V. Honsinger**, USN (retired), graduated from the Naval Academy in 1927. When he received our class directory, he was impressed and wrote to **John Brown** as follows: "First, I cannot attend our reunion in June. It's not that far away, but I will have just returned from Annapolis, where I will be present for our 65th. Second, your booklet shows that you do not know the whereabouts of two lifelong friends of mine—both also Navy. **Herb Pfinstag**, with whom I walked to MIT every day for two years from the Harvard Square area, died in California on June 11, 1983. **P.W. Snyder**, with whom I was very close for the last 20 years, died about a year and a half ago. His wife had died some six years back and he had moved to a Life Care Center in Baltimore. Third, I'm enclosing my check as you asked, to help pay some of the class costs. Have a good reunion!"

Elton Buckley was pleased to receive our Class Directory—he's amazed that so many of us are still around. He and wife Grace had a few bad years—heart attack and other ailments—but they have enjoyed excellent health the last three years. He has been in touch with **Bill Walsh**, who is living with his second wife (a sister-in-law of his first). Elton also writes, "Believe it or not, I have given up golf. No good reason except for my ego. My handicap was 10-12. After my second heart attack, it rose to 20. Besides, some of my golf friends had died." Elton was a chief chemist for several companies in and around Attleboro, Mass. He retired in 1973. Today he and Grace enjoy their grandchildren and do not want to "bore" us with their unusual exploits.

Alfred Mulliken writes that the Southwest Florida MIT Alumni Club will hold its annual business meeting and luncheon at the Whiskey Creek Country Club in Fort Myers. The meetings attract 60 to 70 MIT alumni. Alfred has enjoyed golf at the club for the last 17 years. He has served as an officer and on the golf club board. . . . **James Robson** regrets that he cannot attend our 60th because his grandchildren are graduating from college the same week. He did enjoy getting the class directory and sent in his class dues. . . . **Bernard McMorro** is coming from Honolulu to our 60th with his son and grandson. He liked our Class Directory and also sent his dues. . . . We received many good responses and should have a very good reunion.

We have received the sad news that Mrs. Katherine S. Burrows died December 19, 1991, and that Mrs. Winston B. Braxton died January 5, 1992. . . . From Switzerland we learn that **Rene G. Hochreutner** died in November 1991 in his eighty-fourth year.—**Melvin Castleman**, secretary, 163 Beach Bluff Ave., Swampscott, MA 01907

33

60th Reunion

William Niessen, CE, passed away October 10, 1991. He had resided in Marco Island, Fla., since

1967 when he retired from American Hoist & Derrick Co. as chief structural engineer. His son Charles is Class of '62, electrical engineering, and his grandson Christopher is Class of '93, electrical engineering. His widow, Ruth A., remains at Emerald Beach Apartments, Marco Island, FL 33937. . . . **Raymond Smith** (Course II) passed away January 12, 1992, in Kingsport, Tenn. With the exception of six years in the service, retiring as a colonel, he was manager of the Greenland plant of AFG. Mrs. Smith resides at 1521 Fairridge Dr., Kingsport, TN 37664.

James M. Dunlap died December 30, 1991. He received a PhD from Columbia and worked in the field of gifted children at the Speyer School in New York, on faculties of schools in Kanawha, W.V., and Rochester, N.Y. He was also school psychologist for University City School Systems, a suburb of St. Louis. His widow, Elizabeth Dunlap, lives at 6063 Westminster Pl., St. Louis, MO 63112.

It occurs to your secretary that if any of our classmates die who are known to you, it would be a great favor to his or her classmates if you would notify me at once, and if you wish to contribute to flowers, that would be very nice, indeed.

Due to the long lead time and to **Len Julian's** Christmas letter arriving about 10 minutes after the last deadline, I now report that he spent the usual January ('91) in Florida, took a cruise on the S.S. *Norway* in the Caribbean, saw his children in Atlanta and Orlando, and had a lovely birthday party for his 80th. Daughter Sheryl received another food journalism award, and her PBS program on cooking was presented at Bloomingdale's.

Walt Skees, our most active correspondent, has sent two letters. He is approaching 80, is busy in real estate, and finally succeeded in having his son take over.

A letter to **Burt Webster** from **Roger P. Congdon**, Givens Estates, 15-B Wesley Dr., Asheville, NC 28803: Career encompassed MKM Knitting Mills as controller; then Weyerhaeuser bought it. He continued there until 1975 when he was controller and served thereafter as a consultant selling surplus metal buildings, then to Asheville in 1977. Living in a very pleasant Methodist retirement community with 160 acres of land, and a \$2.5 million estate.—**William B. Klee**, secretary, Box 7725, Hilton Head Island, SC 29938, (803) 785-7746

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Please send news for this column to: **Robert M. Franklin**, secretary, Box 1147, Brewster, MA 02631

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I regret reporting the deaths of two more of our '35ers: **Beverly Dudley** and **Lorin A. Presby**. Beverly died September 24, 1991, in New Hartford, Conn., after a long illness. His professional work began as engineer for RCA developing metal-cased radio tubes. He joined McGraw-Hill Publishing Co. and became managing editor of *Electronics* magazine. He was co-founder and managing editor of *Photo Technique* and editor of McGraw-Hill's radio communication series of technical books. When Dr. Killian became vice-president of MIT, Beverly was asked to succeed Dr. Killian as editor of the *Technology Review*. Prior to his becoming a staff member of the Institute for Defense Analysis in Washington, he was assistant director of the Lincoln Laboratories and did classified research for the Laboratory for Electronics. He retired in 1971 and moved with his wife, Rene Dagmar Dudley, to North Adams, Mass. She died there March 10, 1983. They had no children.

Lorin Presby died December 17, 1991, in Lancaster, Pa. He worked for many years for Ebasco Services, Inc., of New York City. His assignments were varied but most of his clients were hydroelectric sources, world-wide, including Australia, Turkey, and Taiwan. He retired in 1978 and he and his wife, Jeanette, did a great deal of traveling. In 1981, they moved from their home of

35 years in New Jersey to Spokane, Wash., Jeanette's home town, putting them only two hours from their summer cabin at Priest Lake, Idaho. In 1989, Lorin had moved to Lancaster, Pa. They had no children whom I could contact to get the details.

I hope I shall be receiving some cards or letters as a result of our Class President's letter in the March/April Review. A few years ago when news was light I always had a great deal of golf news from our Class Golf Tournaments. My own golf game leaves much to be desired but at least I have a good time trying each Tuesday morning. Write and tell me your summer and fall plans. I shall be back in New England for a couple of weeks in October to catch up with nine eastern grandchildren, four children, and three in-law spouses.—**Allan Q. Mowatt**, secretary, 715 N. Broadway #257, Escondido, CA 92025-1880

36

March 2: Phoebe and I are just back from a trip to Hawaii, a boat cruise, and visits with five classmates. At Kona on the "Big Island" (Hawaii), I saw **Harry Foster**; on Maui, **Arnold Kruse**, **Bill Royce**, and **Rob Wead**; and on Kauai, **Homer "Jim" Webster**. Rob helped in the planning stages, and he and wife Nilsa entertained Phoebe while I made other Maui visits. On Oahu I could not locate **Donald McCluskey**, a resident for some 20 years, and calls to three other McCluskeys found no relations. If anyone has information, please let me know.

Harry Foster, Course VI-C, went out from New Jersey in 1971, bought remote undeveloped property, and has 30 lots remaining for a comfortable income. During World War II at Bell Labs, he helped develop lightweight radar for airplanes spotting U-boats, which made them almost ineffective within two weeks. They didn't dare surface or use their snorkels to recharge batteries, or even raise their periscopes. Later in his own business, he adapted war surplus to civilian uses, developed new electrical instruments, and won 25 patents. At Tech, Harry had **Bill Metten** as lab partner, and was active in fencing and rifle shooting. His recollection of daily travel will strike a responsive chord with about one-third of the class who commuted: Kendall Square to Sullivan Square for a dime, with a free transfer to the Stoneham trolley, then hitching to his home in Reading. (Let's hear from other ex-commuters.) Wife Lorraine is expert in needlepoint and created from scratch a relief map of the island. She blended yarn strands of varied shades to portray the volcanic topography.

Arnold Kruse was born on Kauai and earned an SM in Course X after an SB at the University of Hawaii. During World War II he was lieutenant commander USN, based in Honolulu. In 1956 he took the advanced management program at Harvard Business School. Once an avid golfer and orchid culturist (past president of the Maui Orchid Society) he was afflicted in 1985 with strokes and arthritis, which left him immobile and almost speechless. Yet he received me with a smile and wife Althea had prepared a delicious lunch. Mary, his first wife and mother of three sons living in California, died in 1975. By telephone, son William told of his father's career with Hawaiian Commercial and Sugar Co. (C&H sugar in supermarkets) as head of engineering and consultant to the parent company Alexander & Baldwin, Inc., one of the "Big Five" of Hawaii. The operation involves cultivation of tens of thousands of acres of cane and its processing. "My father was always proud of MIT."

Bill Royce, Course XV, captained the freshman cross-country team during his brief time at Tech, left in his sophomore year to work for his father's foundry business in Cambridge, and took extension courses at Harvard. In World War II service as an invasion glider pilot, he saw high casualties where the Normandy "hedgerows" turned out to be rows of trees too high for cramped landings. Later he attended UCLA for three years' credit and worked in design and technical writing for Northrup,

including material that won the Freedom Fighter contract. In Hawaii since 1962, he was an officer of Bishop Trust Co. and Maui Land and Pineapple Co. He helped start the Honolulu MIT Club in 1964. Since 1973 he has run a "modest" investment trust, consulted on waste recycling, and developed a new technique for growing mushrooms. "Keep active as much as possible," he says.

Rob Wead, Course XIII, told Phoebe and me of sensing long ago an ability in counseling and hypnotherapy. So after a career in engineering he earned an SM in family counseling in 1979 at the University of La Verne, moved to Maui, and set up a private practice. His many accomplishments and honors have been reported in previous issues. This January, the Maui Community College had Rob treat 40 staff members in two groups, all smokers, so that all of the staff could set an example to students for a nicotine-free campus. Rob's usual 85% success rate prevailed. He won the Hawaiian First Lady's award for volunteer service in 1983 and 1989, and had just been appointed by Governor Waihee to the State Council on Substance Abuse and Mental Health.

Maui and Kauai seem to vie for "most beautiful island." After three days in Oahu with old friends and tennis partners from New Jersey, we flew back to Kauai, enjoyed the beaches and a spectacular helicopter view of the rugged wilderness, and visited Jim Webster and wife Anne. Jim was in Course XVI, then transferred to Tufts. In 1935 he entered the Navy as an aviation cadet, won his wings at Pensacola, flew pontooned biplanes off a deck catapult (!) on the battleship *West Virginia*, then became a flight instructor. After his four-year hitch, he stayed in the Naval Reserve and flew DC-2s for Eastern Airlines, where he saw Ken Winsor. As war neared, Jim volunteered and worked up from J.G. to commander, in charge of 30 DC-3s hunting submarines and flying quartz crystals from Paraguay to England. Promoted to captain in 1954 and retiring in 1957, he spent three years in space telemetry with NASA at Canaveral, then started an amphibious aircraft business at Boeing Field in Seattle. Retiring again in 1965, he built a lovely home on Kauai's north beach, from which he and Anne return to Kirkland, Wash., June through December each year. Vigorous at 80, Jim has a 1942 classic mahogany Cris Craft there, and at Kauai he sculpts Easter Island-type heads and other forms from the lava rock for family and friends.

Last issue mentioned "eye-teeth" to get seats on a spectator boat for America's Cup trials off San Diego. Phoebe (once a Girl Mariner) and I found another way: we won seats for April 18-19 in a local raffle! To date, Bill Koch's ('62) boats have beaten Conner's, four or five to zilch.—**Frank L. Phillips**, secretary, 1105 Calle Catalina, Santa Fe, NM 87501, (505) 988-2745; **James F. Patterson**, assistant secretary, 170 Broadway, Pleasantville, NY 10570, (914) 769-4171

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The 55th Reunion is over, but because of the writing and printing time lag for class notes, a full report of the reunion activities will not appear until the October issue of *Technology Review*.

Harry Corman writes that he is semi-retired and involved in structural design and job management. He gave up piloting his own plane after 52 years when his doctor said, "Don't fly over my house anymore." He is still active in tennis, ice skating, and piano. . . . **Walt Wojtczak** presided over the meeting of the MIT Club of Southwest Florida when Dr. Charles M. Vest, president of MIT, was the speaker. John F. Glacken, '38, states that Walt did a great job and John was proud to be there. I hope you noted on page 40 of the February/March issue of *Technology Review* that Walt and his wife, June, were featured with a "Donor's Profile" for giving a Gift of Capital to the Karl T. Compton Pooled Income Fund. It was a fine report on Walt's activities and interests.

Art Zimmerman retired in 1991 as executive director of the Cleveland Commission on Higher

Education. His interests are history, tennis, alumni, and civic and organizational activities. He was asked recently to serve on the Adult Education Advisory Council of Cleveland Public Schools. . . . Marge and **Dick Young** (our reunion chair) moved from Newport, R.I., to Massachusetts. Their new address is Fox Hill, 10 Longwood Dr., #225, Westwood, MA 02090, and they are now neighbors of Ruth and **Phil Peters**.—**Robert H. Thorson**, secretary, 66 Swan Rd., Winchester, MA 01890

38 55th Reunion

New Hampshire Rep. **Beaton Marsh** of Colebrook has been appointed by the governor to the Northern Forests Land Council. He attended the University of New Hampshire and Course I (civil engineering) at MIT. The council is a nonprofit 17-member advisory organization that studies forest economy and land uses of the 26-million-acre northern forest stretching from upstate New York through northern portions of Vermont, New Hampshire, and Maine. A native and longtime resident of the state's north country, Beaton serves as vice-chair of the New Hampshire House Public Works Committee and is a member of the Legislative Administration Committee.

Horace Homer, our president, has been informed that nine outstanding undergraduates have been named Class of 1938 Scholars. They represent six different courses, ranging from economics to computer sciences, and six different states. All maintain outstanding academic records and hold part-time jobs during the school year to help with their educational expenses. Most also participate in a wide range of extracurricular activities, holding leadership positions in many cases. As the Financial Aid Office wrote to Horace, "It is very exciting to see how the fund has grown over the last few years and is able to continually increase the number of students being assisted."

James C. Longwell has created the Longwell Scholarship at MIT for the benefit of students from western Pennsylvania. He named it for his parents, Dr. and Mrs. Benton Elkins Longwell, Sr., who lived in the Johnstown, Pa., area, where John attended Westmont High School. Jim set up the fund in 1981 and has made generous contributions to it over the years. So far the scholarship has provided aid for 15 students, all from western Pennsylvania. Jim served as advertising manager and associate business manager on *The Tech*, graduating in Course IX, general engineering. After graduation he held positions in several firms, including duPont, Lockheed Aircraft, and Electro Watt Engineering Device in Switzerland. Currently retired, he lives in Boca Raton, Fla.

By the time you receive these notes, we will have had the Endicott House Mini-Reunion that Ed **Hadley** mentioned in the previous issue. And soon you will be receiving a "save the date" announcement for our 55th Reunion, whose program Ed outlined in considerable detail.

I received a note from his wife, Barbara, that **Lester Kornblith** died last January 12 at their home in Sarasota, Fla., following a heart attack. She adds, "He was so devoted to MIT, and we both enjoyed the reunions so much." We'll miss Lester and hope Barbara will feel welcome to see some of their longtime friends at our reunions. Those who knew Lester will recall him as a quiet, unassuming, and practical man who had a way of listening to others. He served four years in the Signal Corps in the U.S. and Europe. Upon his return, he joined Dr. Enrico Fermi as his chief engineer for construction of the cyclotron at the University of Chicago. Later he joined G.E. to work on the design, construction, and initial operation of the Vallecito, Calif., nuclear reactor—the first privately owned nuclear power plant. In 1963 he joined the AEC as assistant director for reactors of its Compliance Division. Subsequently, he was a licensing committee member of the Nuclear Regulatory Commission and VP of the National Nuclear Corp. in Mountain View, Calif. He retired in 1985 to Sarasota, where he was an active member of the MIT Club of Southwest Florida.

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There *will be golf, tennis, swimming, harbor cruise, museums, Everglades visit, cocktails, good food, and good conversation with lively MIT alums!*

For more information, write:
Norman Klivans

President, Class of 1940
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Marvin Kahn's son telephoned the Alumni/ae Association to report that his father died in April 1990. Our only background comes from our three Class Reunion books. He spent three and a half years in radar with the 8th Air Force. His professional career was primarily in the development and engineering of rubber and plastics, and he held several patents in the field. Ed and I would appreciate it if anyone can provide more details.—**Don Severance**, secretary, 39 Hampshire Rd., Wellesley, MA 02181; **Ed Hadley**, assistant secretary, 50 Spofford Rd., Boxford, MA 01911

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Harold Muckley and Betty revisited MIT for the ceremony honoring Harold's father for whom Building E40 at One Amherst St. was dedicated the Dwight S. Muckley Building (see January issue, p. MIT 22). Harold's career includes achievements in the pipeline industry where he served as president of the Pipeline Contractors Association. He is director of Partners Oil Co., Mountain Banks Ltd., Marathon Manufacturing Co., and Sedco, Inc. He served on two Government boards: The Petroleum Administration for Defense, Department of the Interior; and the Pipeline Technical Committee, U.S. Department of Transportation. He is Life Member Emeritus of the MIT Corporation and served on the

Visiting Committee of the Department of Civil Engineering, and the Visiting Committee of the Department of Ocean Engineering, and on the Audit Committee.

Kenneth Robert's unusual hobbies of researching and collecting old tools and Connecticut vintage clocks stimulated the *Keene (N.H.) Sentinel* to devote seven columns and two pictures to the story. Ken enjoys showing his collections at Fitzwilliam, N.H. He lectures and publishes histories on the development and manufacture of old-time tools and clocks. Visitors to Ken's museum ask about an odd-appearing tool resembling an old garlic press and are surprised to learn it is an early tooth extractor.

Irv Peskoe and **Bea**, retired after many reelections to Mayor of Homestead (Fla.), expect to attend the mini-reunion next January in Naples, Fla. Irv relays news that **Dave Morgan** divides his year between residences in New York, West Palm Beach, and various hotels as he continues international travels for pleasure and business. Dave was president of Peerless Precision Products before he sold it in 1989. His career includes adventures in drilling and production of oil and gas wells. An unusual family reunion started for Dave when one of his daughters flew from London to visit her Dad and presented him with keys to a new Rolls Royce. Dave, is it true that one can stand an unsharpened pencil on the hood of a Rolls Royce and race the engine without causing the pencil to fall?

Seymour Sheinkopf and **Sylvia** send this letter from a young MIT coed who is benefiting from a scholarship funded by the Class of 1939: "... I am a senior in mechanical engineering completing my final undergraduate term at MIT and am grateful for the scholarship the Class of 1939 established. Your thoughtfulness and generosity helped make my fourth year at MIT possible when, for a short time, it seemed I would be unable to complete my degree due to financial difficulties. I plan to continue studies in mechanical engineering design for a master's degree, with possibility of a PhD afterwards. Would you please extend my thanks and my best wishes to the Class of 1939."

Bill Pulver and **Adie** enjoyed more skiing in Colorado. After returning to their home at Lakeville, Conn., where they share ownership of a DN iceboat, Bill writes: "... with clear ice and no holes, we made a home video from the cockpit. Speed was probably about 30 m.p.h., but the careening made it seem like 100! After a side trip to the Virgin Islands, we expect to return to Lakeville for serious golfing." They also plan to attend the January mini-reunion for more golfing.

Sid Silber and **Jean** are adding to their lovely home in Lutherville, Md. ... **Fred Grant** and **Ginny** spent several weeks in Naples, Fla., to brush up on their golfing, revisit longtime friends, and prepare for return to their Wellesley home and their 1040 return to Uncle Sam. ... **Bill Brewster** and **Lucile** recently visited Venezuela, but didn't see any unusual oil wells, pipelines, tooth extractors, or tax extractors.

Bob Touzalin and **Aletta** plan canal barging in England with the **Fred Cookes** this summer. On return to Naples, Fla., they expect responses from '39ers who plan to attend the mini-reunion. Commitments by '39ers should be mailed to Bob Touzalin at 279 Mel-Jen Dr., Naples, FL 33942 before August 1, 1992.—**Hal Seykota**, secretary, 2853 Claremont Dr., Tacoma, WA 98407. **Jim Barton** informed the Alumni/ae Office in April that Mr. Seykota was undergoing surgery to install a pacemaker. Please send cards to him at the address above.

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Please send news for this column to: **Richard E. Gladstone**, secretary, 1208 Greendale Ave., Needham, MA 02192, (617) 449-2421

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For the past three years **Joe Gavin**, a member of the National Academy of Engineering, has been

participating in its study committee on Profiting from Innovation. The committee was composed of nine members of the Academy, all present or former top executives of government or top major U.S. corporations such as Motorola, Ampersand Ventures, Boeing, Dean Technology, DuPont, Grumman (guess who), SRI International, and Minnesota Mining and Manufacturing. In November 1991 the Academy released the final report, *Profiting from Innovation*, published by the Free Press, a division of Macmillan, Inc., and has had great reviews. For example, Ruben F. Mettler, former chair and CEO of TRW, Inc., says, "An important book that will help managers understand that sustainable success in business requires a never-ending quest for innovations."

A brief note to the Alumni Association from **Paula L. Downes** reports that her husband **John A. Downes**, Course IV, passed away on July 14, 1988. There were no other details. Her present address is the same given for John's residence in past Alumni Directories: Le Riou, Domaine Du Loup, 06800 Cagnes, Sur Mer, France. The class expresses its condolences to his family.

Charlotte and **Will Mott** celebrated their 50th wedding anniversary on March 14. Several of our classmates participated in the original event in 1942. The four Mott daughters organized a family celebration at Lake George, N.Y. Our congratulations to the owners of one of 1941's senior marriages!

John Murdock sends the following report of the probably most junior marriage in the class: "Linda England and **Fred Haddock** were married on March 21 in Independence, Mo.! Classmates at the 50th Reunion will remember her as the glamorous and gracious lady (somewhat younger than the rest of us) who came with Fred from Ann Arbor. At their wedding she looked great and Fred even wore his red jacket! Janet and I represented the class of 1941, almost lost in a large crowd of children and grandchildren from both sides of the aisle. It made us feel young again to attend a classmate's wedding. The happy couple is now off on a long trip to the west coast."

Congratulations to Linda and Fred from all his classmates.—**Charles H. King, Jr.**, secretary, 7509 Sebago Rd., Bethesda, MD 20817, (301) 229-4459

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John Whitman still works full-time on Soviet Continental Defense at the Defense Intelligence Agency in Washington. He says that son John was just elected full professor of Asiatic linguistics at Cornell. Certainly a most impressive title to be sure!

News has slackened off to a new low of practically nothing but obits. So perhaps the reunion will get things rolling along again.

Two obits: **Joseph Davis** in Cambridge and **Chuck Hofmann** in West Yarmouth. Condolences to their families.—**Ken Rosett**, secretary, 281 Martling Ave., Tarrytown, NY 10591

43

50th Reunion

Class prexy **Jim McDonough**, with a broadcast letter in March, told everyone about our new Class of 1943 Career Development Professor, Dr. Irene Heim of the Department of Linguistics and Philosophy. He also mentioned the 50th Reunion location at the Black Point Inn, Prout's Neck, Me. Finally, he devoted five paragraphs to the Reunion Gift, with \$2.1 million raised at that time. What's a poor Class Secretary, with a three-month publication lag, to write about?

Fortunately, I have at hand a clipping from the Lynn, Mass., *Daily Evening Item*. It reports that **Stanley C. Paterson** is a co-author (with Carl C. Seaburg) of *Nahant on the Rocks*, a 432-page "meticulously researched and highly personalized history of the Town by the Sea, which is often referred to as America's first summer resort." After graduating from MIT, Stan got a law degree from Northeastern. He settled in Nahant in 1951, and is

currently president of the Historical Society and past president of the Society for the Preservation of New England Antiquities. Paterson and Seaburg, who published another joint volume in 1970, began work on *Nahant* 25 years ago.

If I ever complained about a lack of information from **Virgilio Barco**, I take it all back. I have just received a four-page curriculum vitae, detailing his life from birth in Colombia to his present position of Ambassador to the U.K. It is, to say the least, impressive.

MIT civil engineering degree in hand, Virgilio returned from Cambridge to Colombia, where he began working his way up the ladder in municipal, departmental, and national politics. His service has included heading government ministries, ambassadorships (U.S. and U.K.) and other foreign representation for his country, election to municipal councils and the national legislature; and election as President of the Republic of Colombia, 1986-90. He has also had an equally distinguished career in academics. He has been a university professor, a member of numerous learned societies, and the recipient of honorary degrees from universities in Colombia, South Korea, Japan, and the U.S. MIT, as well, has benefited from his service to the MIT Corporation and on several visiting committees.

In recognition of a lifetime of service, Virgilio has received Grand Crosses, Stars, Cordons, Chains, Medals and a variety of awards from 19 nations. In all of this, he has had the loyal support of a wife and four children.

The rest of you need not match Virgilio's resume. A simple letter will do, or just a postcard.—**Bob Rorschach**, secretary, 2544 S. Norfolk, Tulsa, OK 74114

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Dianne and **Andrew Corry** have just returned from an extended vacation in the Orient. They toured Thailand, Singapore, Hong Kong, and the magical isle of Bali before going to Hawaii to rest up before heading home. Andy will probably recommend a class mini-reunion in one of these exotic places in the future.

We are sorry to report the passing of three of our classmates. **William G. Schwartz** (ME) passed away on February 24, 1989, in Reading, Pa. He is survived by his wife, Elizabeth. . . **Walter P. Swain Jr.** (EE) passed away on January 6, 1992, in Plainfield, N.J. He was the third generation owner of the Swain Art Galleries founded in 1868 by his grandfather. Walter was a deacon, elder, and trustee of the Crescent Ave. Presbyterian Church in Plainfield. He was chairman of the board of the duCret School of the Arts, Plainfield; a member of the University Glee Club of New York City for 47 years; chairman of the board of trustees from 1969 to 1971 of Raritan Valley Community College; and a past member of the board of governors of Muhlenberg Regional Center, Plainfield. He is survived by his wife, Bernice; two sons, two daughters, two brothers, and six grandchildren. . . **William H. Noyes** (AA) passed away on January 1, 1992, in Amesbury, Mass. Bill was a planning engineering for N.E. Telephone in the Boston Office. He had previously worked for Towle Mfg. Co. in Newburyport, Mass. Bill was a member of the Navy V-12 program and served in the Navy during World War II. Survivors are his wife, Eleanor L., his mother, three sons, a daughter, two brothers, 10 grandchildren, and five great-grandchildren.

Bruce F. Kingsbury reports that he is retired and spends his time carving miniature decoys when not busy with volunteer work. . . **Lewis Tyree, Jr.**, gave a lecture on "Cyrus Hall McCormick from an Inventor's Point of View" at the fall meeting of the Rockbridge Historical Society in the Washington & Lee University Library. Among McCormick's numerous machinery inventions, he demonstrated the world's first successful mechanical reaper which harvested grain five times faster than by hand. Lewis is the former executive VP and chief technical officer of Liquid Carbonic Industries and lives at Mulberry Hill.—Co-secretaries: **Andrew Corry**, P.O.

Box 310, West Hyannisport, MA 02672; **Louis Demarkles**, 77 Circuit Ave., Hyannis, MA 02601

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Correction: In the editing process, Clinton Springer's first grandchild, the bouncing Joanna, was inadvertently assigned to Phil Pocock. For the record: little Joanna is not related to Pocock. Her mom is Springer's daughter Betsy, and her dad is Larry Schembri, PhD '85. We regret the error.

Please send news for this column to: **Clinton H. Springer**, secretary, P.O. Box 288, New Castle, NH 03854

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Things are looking up; what with letters and notes from President **Glen Dorflinger** and **Ned Tebbetts**, and a message from **Seward Kennedy**, coming all the way from London. Seward's latest news is that Texas Eastern, the company for whom he's worked for over 16 years has sold off their North Sea assets and merged with Panhandle, ending his London job. Since then he's been consulting in energy and the environment, including setting up a new futures contract, acting as expert witness in legal oil cases, helping in negotiations for sale and purchase of North Sea gas, etc. Seward would have come to the Kiawah Reunion, but never got the information. He will still be "looking forward to the 50th"—and maybe more as you will read.

Ned Tebbetts is chair of the Cohasset Board of Selectmen, a position he has held for the past three years, and he writes, "like all governments, we struggle a lot with budget issues." (No bounced checks, I hope. . .) By the time you read this Ned and wife, Priscilla, will have gone to Chicago in May, visiting his old Grad House roomy, **L. Bates Lea**, for whom Ned was best man in 1953. "Lee" retired recently from AMOCO Oil, where he had been VP and general counsel. "Lee", turning 65 in September, and wife, Marcia, are in good health.

Glen D. told me how good it felt to receive a letter from one of our V-12 mates, namely his roomy on the 5th floor, **Ray 'Bagger' Brown**, one of the Scarsdale lads. I wrote Glen back, to find out the source of the nickname and got a quick reply. "Bagger" Brown came from 'Brown Bagger' because Ray was one who took his lunch to school/work in a brown bag." Now why didn't I think of that. I know about the name "Knobby." When we "got on board" the good ship Gradhouse we got very short haircuts, and one of my roommates laid it on me. Even now I use it as a code name in my Modem connections. Anyhow, in addition to his notes, Glen sent a description of his latest business venture, Partners for International Development, which "was established to work with companies interested in increasing market share for their products internationally to gain additional profitable business."—**Jim Ray**, secretary, 2520 S. Ivanhoe Pl., Denver, CO 80222

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A newspaper clipping tells us that **Dan Carmese** was a candidate for town meeting representative in Westport, Conn., last fall, but we don't know the results. Dan has been involved in civic affairs for the last 19 years. . . **Fred Ehrich** was recently elected to the National Academy of Engineering. Academy membership honors those who have made "important contributions to engineering theory and practice" and those who have demonstrated "unusual accomplishment in new and developing fields of technology." Fred was honored for contributions to the design and development of aircraft gas turbine engines and the technology of rotor dynamics.

Vince McKusick retired in February from his position as Chief Justice of the Supreme Judicial Court of Maine. He had served in that position since

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1977. His retirement elicited a series of commemorations, ranging from a full issue of the *Maine Law Review* devoted to his career to a banquet and ball in his honor. Vince, though, says he'll be back—he plans a third career in law. No plans announced yet. . . . **Jim Prigoff** keeps us posted again on his travels. He and Arline last year traveled to a number of exotic locations in Peru, Bolivia, Chile, Argentina, Uruguay, Paraguay, and Brazil. All this took place after Arline taught during the fall term at the Universidad Nacional in Bogota, Colombia. Jim was also invited to lecture on public art there and again in Chile.

Gary Reethof recently retired from Penn State University after 21 years as professor and director of the Noise Control Lab. Currently he has a part-time appointment as research professor in the Department of Mechanical Engineering and Mechanics at Drexel, and is continuing his research in acoustics and noise control. . . . We have delayed information that **Mary McClinchey** died November 19, 1990, but no details.—**R.E. (Bob) McBride**, secretary, 1511 E. Northcrest Dr., Highlands Ranch, CO 80126

48 45th Reunion

The Reunion Committee and class officers now have planned our 45th. On Monday, Tuesday, and Wednesday (May 31–June 2) we will meet off-campus on Nantucket before Technology Day activities on the MIT campus. Thursday and Friday (June 3 and 4) will be in Cambridge at MIT with the usual Tech Night at the Boston Pops concert on Thursday night and a seminar presented by the Department of Ocean Engineering in Kresge Auditorium on Friday. The Department is celebrating its centennial anniversary. Friday night we will have a dinner dance at MIT and there may be a seminar program just for our class on Saturday morning. Space is available in the dormitories and at the Marriott Hotel at Kendall Square (the rates per night are different).

Nantucket has a variety of golf, tennis, sailing, shopping, museums, nature walks, and scenic tours for our enjoyment. Eleanor and **Harold Ottobri** who arranged a gala event at Rosecliff in Newport in 1985 and our dinner dance at Walker Memorial during our 40th Reunion in 1988 will arrange another dinner and dance during the Reunion.

Milton Slade is chairman of our 45th Reunion in June 1993. Milton was class treasurer and is now class agent. He has been an active participant in the planning of several prior reunions.

Barry Bloom was appointed executive VP of research and development of Pfizer. He had been senior VP. . . . **Bob Dean** served on a committee of the National Academy of Engineering that made a three year study of technical innovation. The study is reported in a book, *Profiting from Innovation*, that was published recently. The nuts-and-bolts handbook demonstrates how managing technical resources is as important to the paper clip business as it is to microelectronics and describes and illustrates tools and techniques to help managers keep commercialization efforts in any business on track.

Roger Sisson died in January while on a business trip to New York City from his home in Swarthmore, Pa. He was active as a consultant in data processing systems. Roger was one of the first in his field to apply relational file theory to database design. Following graduation he worked at UCLA constructing some of the first computers. He wrote a paper on project scheduling and operations research that remained as an industry standard for many years. In the mid-1950s he and Richard Canning formed the first consulting firm in the EDP field. He joined Ford's Aeronautics Division and they made several innovations in display technology, disc storage, and software design. In the early 1960s, he was an associate professor at the Wharton School and taught operations research and EDP. His research focused on artificial intelligence and planning techniques. In 1970, he joined Mathematica in Princeton, N.J., and worked on

design and installation of software at large corporations. Since 1983 he has been an independent consultant. He is survived by four children and three grandchildren. His daughter, Amy, wrote a note. His children have stated that Roger's death will leave a "tremendous void" in their lives. On behalf of our classmates I extend our sympathy to Roger's children and their families.

John Kessler died in Yarmouthport, Mass. He is survived by his wife, Mildred. . . . **Joseph Christopher** died while in England. He and his wife, Priscilla, had their home in Greenbrae, Calif. He had a long career with Chevron as a marine engineer and manager of maintenance. Later he was manager of new construction. After retiring from Chevron, he worked as manager of engineering for a marine company in San Francisco. On behalf of our classmates I extend our sympathy to his wife and her family.—**Marty Billett**, secretary and president, 16 Greenwood Ave., Barrington, RI 02806, (401) 245-8963

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Although the town of Darien, Conn., is a charming bedroom community, issues common to many communities seeth beneath the surface. Among them are: 1) Maintenance of the town's residential character and protection of its shores and harbor from state control; 2) Rejuvenation of the business district; 3) Maintenance of quality education in the face of cuts in state aid; and 4) Thoughtful control of finances. As one of 21 individuals running for town meeting member in Darien, **Robert A. Arrison, Jr.**, stated that issues 2 and 3 are the ones he feels most seriously affect the future of the town. On issue 3, Bob stated that, in the face of static revenues, money for improved teaching and classroom facilities can be found by cutting administrative and overhead costs. Bob is retired from a technical and general management career.

From Monterey, Mex., **Rodolfo Barrera** writes: "I am chair of the board of Dirona, S.A., which manufactures Rockwell axles and brakes for heavy trucks. I am also chair of the board of Fabrica de Tractores Agrícolas, S.A. de C.V., manufacturers of tractors." . . . **Donald Ridgley**, formerly of Bailey Controls in Wickliffe, Ohio, but now retired to Merrimac, Mass., writes that he was with Bailey for 15 years and, prior to that, had been at G.E. in West Lynn, Mass., for 26 years. Having returned to where most of his family is located, he now lives in a new home of his own design.

Norval White is the author of a new (1991) book, *The Guide to the Architecture of Paris*, published by Charles Scribner's Sons. The dust jacket reads: "Paris has perhaps the most wondrous assemblage of architecture and urban landscape in the world, and through the centuries it has been sought out for its many aesthetic riches by professionals and casual tourists alike. *The Guide to the Architecture of Paris* is a one-of-a-kind guidebook that offers serious connoisseurs the same pleasures in walking, touring, and discovery, and the same endless reservoirs of visual information that Norval White's well-known *AIA Guide to New York City* has provided for more than 20 years."

Some of you may recall that in my January 1992 column, I reported that **Stan Margolin** was authorized to run our 45th Reunion in 1994 on the island of Bermuda. The other night, **Tom Toohy** our class president, called to announce that he had asked **Jack Barriger** to augment Stan's efforts by rounding up attendees from the Midwest. Since no one alive would dare say "no" to either man, we can conclude that this reunion will be well attended.

Harry Lambe called to say that **Tom Moranian** died March 20, according to information he had just received from **Pete Camboureis**. I tried to call Tom's wife, but the number is unlisted. I will provide details when I can. Meanwhile, I am sure I express the feelings of the class in offering our deepest sympathies to Tom's wife, Lillian.—**Fletcher Eaton**, secretary, 42 Perry Dr., Needham, MA 02192, (617) 449-1614

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Please send news for this column to: **John T. McKenna**, secretary, 182 Midpine Rd., Box 376, Cummaquid, MA 02637

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Our class president, **Harold Glenzel**, phoned upon his return from an enjoyable vacation in Florida. He called my attention to a class secretary's report describing a golf tournament conducted by mail each year by the class of 1960. It seems that all those who participate play on a USGA course of their choice and mail in their scores and handicaps to their class's tournament director. Based upon this mailing, they determine the winner and even inscribe the winner's name on a cup. Harold is an avid golfer and felt that if enough of you were interested, he'd like to see a similar tournament conducted by our class. If this appeals to you, please send a note to Harold at 237 Prospect St., Hingham, MA 02043.

Periodically I receive requests from classmates to help locate others in our class. I have a reasonably current class roster and would be happy to help anyone with a similar need. Either write or phone me at (617) 963-4562. I promise to try to respond promptly. If I don't, you can use it against me when I come up for reelection.

On a sadder note, I have to report on the passing of a number of classmates. . . . In December, 1991, **Ralph J. Devir**, former VP of Connie and Donahue Contracting in Lynn, Mass., and a building inspector for the State Department of Health and Hospitals, passed away. Ralph was born and raised in Malden, Mass., and graduated from MIT with a degree in building construction. After serving in the Army, he became an expeditor for Cabot, Cabot, and Forbes Construction in Boston. He also worked on the staff of the real estate department at MIT. He was involved through much of his career with the construction of hospitals, schools, churches, and housing for the elderly. He retired in 1973 and moved to Chatham, Mass., in 1980. We express our condolences to his wife, Carol.

Another loss in December was **George B. Duhnkrack**, president of U.S. Technology of Danielson. George's degree at MIT was in chemical engineering, and he earned a master's in plastic engineering from Princeton. He was a former VP of research and development at U.S. Plastics and Chemical Corp. of Putnam. Prior to that, he was a technical representative for polyester resin applications and development for the American Cyanamid Co. of Stamford. He was a member of the Kappa Kappa Sigma chemical engineering fraternity, the Society of Chemical Engineers, the American Society of Button Manufacturers, the American Standards for Testing Materials, and the American Apparel Manufacturers Association. He served as a member of the Northeastern Connecticut Hospice Advisory Committee and was a communicant of Our Lady of LaSalette Church of Brooklyn. We wish to express our condolences to his wife, Eleanor, and daughter Margaret.

In January, **Ernest Sanlorenzo**, a leading researcher in experimental programs designed to demonstrate the feasibility of certain engines for hypersonic flight, passed away. He had headed programs that demonstrated the feasibility of the engine cycle for the X-30, an airplane capable of flying at 18,000 miles per hour. This plane could take off conventionally and soar into earth orbit. In addition to his degree at MIT in aeronautical engineering, he earned a master's in aerospace engineering from the Polytechnic Institute of Brooklyn. Beginning his career with the Air Force at Arnold Engineering Development Center in Tennessee, he served as project officer for design and construction of the von Karman Gas Dynamics facility. In 1956, he joined the Nuclear Development Corp. of America in Connecticut, working on the government's Aircraft Nuclear Propulsion Program. In 1957, he joined the General Applied Science

Laboratory, Inc., in Ronkonkoma. In 1982, he received the NASA Langley Group Achievement Award for heading GASL's effort that demonstrated scramjet engine performance at levels appropriate for hypersonic flight. We send our condolences to his wife, Gloria, and to his son and three daughters.

Another loss in January was **John H. Winn** of Cambridge, Mass., an electrical engineer for Badger Corp. We send our sympathy to his wife, Hee Sun, and to his sons and daughters.—**Martin N. Greenfield**, secretary, 25 Darrell Dr., Randolph, MA 02368

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News of retirement comes up more and more frequently. **Clifford Sayre** writes that he has taken early retirement from Du Pont, where he was VP-logistics. Cliff hopes to teach, do research, and consult. . . . **Davis Ulrich** says he is continuing to enjoy semi-retirement in West Hartford, Conn., and his wife is active in many genealogical organizations. His oldest son was commissioned in the U.S. Army Chemical Corps last year; his daughter is in graduate school at American University; and his youngest son has just graduated from college. . . . **Art Freeman** shows no sign of slowing down. A professor of physics at Northwestern, he has submitted his usual 16 or so papers at the March meeting of the American Physical Society, all on computing the properties of matter.

Mike Goldman decided he has been too long out of contact with his class and has written a letter bringing us up to date. He got a master's degree from Sloan School, fulfilled his ROTC commitment in the Army, and went to work for GE, eventually ending up in Phoenix in 1963. He says he started to dabble in product introduction for the GE Computer Department. He has been doing the same type of work, in Phoenix, ever since, although successively for GE, Honeywell, and Bull as the operation changed hands. He is now in charge of making large Japanese computers into large Bull computers. He married in 1957 and has three daughters and two grandchildren. He was president of the Phoenix MIT Club, which he says has been moribund before, during, and since his incumbency, and has been an Educational Counselor for MIT since 1967. Last fall he was at MIT to receive the Morgan Award for that service.

We are sorry to announce the death of **John C. Casson** of Springfield, Ill., March 23, 1991. He was the president of Casson Engineering Co. He is survived by a son.—**Richard F. Lacey**, secretary, 2340 Cowper St., Palo Alto, CA 94301

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Please send news for this column to: **Gilbert D. Gardner**, secretary, 1200 Trinity Dr., Alexandria, VA 22314, (703) 461-0331

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A welcome letter from **Jerry Cohen** informs us that he is hoping to step down from his position as dean of the Robert R. McCormick School of Engineering at Northwestern University, after six years in the job, and go back to full-time teaching and research. He has expanded the faculty, programs, enrollment, and facilities of the school during his tenure. He has received an honorary doctorate from the University of Linköping in Sweden, the Acta Metallurgical Gold Medal, and the TMS Gold Medal and Mehl Lectureship. Other than that, he has been goofing off. He and Lois are enjoying their first grandchild.

Bob Warshawer sends mail he received at the time of our reunion in 1989. A letter from **Paul Valerio** reports that he tried to join us but was delayed and missed the festivities. He has a structural engineering consulting firm in New York City, working with two of his sons. All four of his

children are married and have produced three granddaughters. Paul also reports that **Marty Raab** is a principal in a large New York City architectural firm. . . . **Joe Bova** also wrote to Bob during the summer of 1989, expressing his disappointment at not being able to attend the reunion. At that time, he was on the Island of Borneo—he has lived in the Pacific and Southeast Asia areas for years. He was working on a new project on Papua, New Guinea, that summer. . . . And **Dick Finn** wrote at the same time from Seoul, Korea, where he is president of Digital Equipment Corp.'s subsidiary. Dick says that he and Elaine would certainly welcome hearing from any members of the class passing through Seoul.

Dick Morley has been featured again in a professional magazine. He has interviewed for an article in the December 1991 issue of *Production*. The article describes Dick's views on chaos, technology, and the process of manufacturing in the year 2001. Dick is the chief executive officer of Flavors Technology, Inc., in Amherst, N.H., and has to his credit several major inventions in the area of automated manufacturing.

Drop me a note with the latest news about your activities—the class is interested.—**Edwin G. Eigel, Jr.**, secretary, 33 Pepperbush Ln., Fairfield, CT 06430

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Max Musgrove, Course I, informs us that he retired to Mayaguez, Puerto Rico, three years ago. He is now mixing a lot of cement and doing some welding for home improvements; he also does some free consulting on concrete construction for friends. For other kinds of fun, Max occasionally lectures on underwater photography on the tour ships. . . .

Gordon Pye (Course X, Alpha Tau Omega) made the news with a feature article in the *New York Times* last December decrying the popularity of corporate downsizing and wholesale layoffs as a solution to our competitive and economic problems. Gordon argues (much better than this reporter) that resources ought to be focused on means of raising revenues, not just cutting costs. Gordon is the founder of a New York financial planning firm bearing his name and the former chief economist of the Irving Trust Co.

A most welcome note from **Seabury McGown** (Course IX, Delta Upsilon) brought us up-to-date on his exciting life. Sea had retired about four years ago from his position as VP of engineering at Chris-Craft Corp., and has been working as an independent marine design consultant. He lives in Longboat Key, Fla., near Sarasota, where we visited with Sea and Franny when we were staying with Joan and Jacques Linder a couple of years ago. Almost every week he races in his O'Day Daysailer, and last summer he raced in the Daysailer National Championship Regatta in Maine. Now they are preparing to move permanently to a renovated and winterized ex-summer cottage in Cotuit, Mass. Fran will unfortunately have to give up her job as a teacher in a small private school, but the thoughts of a beautiful home on Cape Cod, continued sailboat racing, and woodworking for Sea will hopefully make it all worthwhile. . . . **Lee Zuker** (Course XVI, Phi Gamma Delta) writes that Marlene has completed her year as chairman of the Museum Guild in Bellevue, Wash., leaving it in better organizational and financial condition than ever before. Lee continues to travel on business at a frantic pace, but managed to squeeze in a weekend in Hudson for his high school class reunion. Their spare time is primarily taken up with antique car activities: a three-week tour of the Canadian Rockies in their '39 Bentley; a trip to Monterrey, Calif., to attend the Pebble Beach Concours d'Elegance; and associated Rolls Royce meetings and other tire-kicking events.

Gerald Kliman, Course VI, attended the 35th Reunion and thought that the rest of us might like to catch up on his life. Jerry continued on at MIT, with a two-year interruption as an armaments and electronics officer for an Air Force fighter squadron, and got an ScD in 1965. After several years on the

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faculty at RPI in Troy, N.Y., he joined General Electric's Transportation Division in Erie, Pa., to work on linear motors and AC drives. He then moved to GE's Nuclear Division in San Jose, where he worked on the world's largest electromagnetic pump, then back to the GE Corporate R&D Laboratory in Schenectady in 1978, where he has been ever since, working on a variety of electrical issues. Jerry married Edith Moses, from Wellesley, and they have two fine boys getting on with their careers. Edith and Jerry are continuing with their musical activities, playing with a community orchestra; Jerry as concertmaster and Edith as principal violinist, as well as both serving in administrative capacities and filling up their family room with music cabinets. They are also active in various organizations of their synagogue and other community activities.—Co-secretaries: **Roy M. Salzman**, 481 Curve St., Carlisle, MA 01741; **James H. Eacker**, 3619 Folly Quarter Rd., Ellicott City, MD 21042

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Bernardo Blaschitz, president of the Ingeniero Besca Oil Co. in Caracas reports: "Venezuela is a country that revolves around its oil industry. We produce around two million barrels per day and have investments outside Venezuela like Citgo in the U.S.A. and half of the refineries of Veba Oel in Germany. Our two largest are: Project Cristobal Colon, for producing liquified natural gas, where the partners of PDVSA (Petroleos de Venezuela), the holding company of all oil-related activities) are Shell, Exxon, and Mitsubishi; and a heavy crudes refinery for Corpoven (one of three operating companies), with the plan of eventually producing 400,000 barrels per day. Each of the above projects is estimated to cost \$4 billion.

"Another development that may be of interest is the new fuel, 'Oriemulsion', that PDVSA has been producing for more than one year. It is an emulsion of heavy crudes and competes with coal but with definite advantages in its handling. If any classmates are interested in more information on the above projects, they can feel free to write to me." Bernardo's wife, Milagro, is a special education teacher; daughter Diana is an attorney and member of the N.Y. Bar; and son Gustavo Adolpho is a student at W.P.I.

Kreon Cyros, director of MIT's Office of Facilities Management Systems, was featured in the May issue of *Facilities Design & Management*. Kreon is responsible for space accounting and planning for MIT's 126 acres, 9.1 million gross square feet of space, and 27,000 rooms. He created Institutional Space Inventory Techniques (INSITE), a complex database management system that stores and analyzes facilities data, a system shared with Brown University, Harvard Medical School, Syracuse University, and many other organizations through MIT's INSITE Consortium. Another area of responsibility for Kreon is the International Society of Facility Executives, a program of courses, conferences, and other activities to exchange facilities management information among experienced operating facilities managers. He also lectures throughout the U.S. and Canada as well as Europe and the Far East. He is currently creating a video library of ISFE conferences.

Send news to **Ralph A. Kohl**, co-secretary, 54 Bound Brook Rd., Newton, MA 02161

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Although by the time this reaches you it may be more in the nature of history than news, the National Academy of Engineering has announced that two members of the class were elected as members. **Art Bergles**, who is dean of engineering at RPI, and **Ray Stata**, who is chairman, president, and CEO of Analog Devices, Inc., were among the 79 engineers elected this year. Congratulations to both of them. . . . **Marc Richman**, professor of engineering at Brown, has been elected a Fellow of

the National Academy of Forensic Engineers. . . . **Silvester Pomponi** has been promoted to technical director of the International Command, Control, and Communications Division of the Mitre Corp. . . .

Michael Mintz writes that he has established residence in Boca Raton, Fla., after over 20 years of starting, running, and finally selling his medical diagnostics manufacturing company. He says he got his children through colleges and law school and added two sons-in-law, a granddaughter, and three grandsons to the clan. . . . **Dennis Begany** has recently closed financing of \$156.5 million for construction of a 135 MW combined cycle electric power facility in Newark, N.J., in partnership with a subsidiary of Public Service Enterprise Group and with ENPEX Corp. of San Diego.

The class will be saddened to learn of the death of **Robert Boese** in August 1991, and **Andre Boeschert** in April 1991.—**John Christian**, secretary, 23 Fredana Rd., Waban, MA 02168

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35th Reunion

'Tis always better, we presume, to appear than not appear in these pages. So, despite a paucity of postcards, here is the news for this month. Two of our classmates have been elected to the National Academy of Engineering. **Arthur Bergles**, currently the dean of engineering at Rennselaer, was named for his outstanding service and leadership in the field of heat transfer. At RPI, Art holds the post of Clark-Crosson Professor in the Engineering School. Also joining the academy is **Elisabeth Drake**, the associate director of the MIT Energy Laboratory. Liz was cited by the academy for her leadership in risk management and industrial safety.

In the February/March column, you'll recall reading that **Ron Newton**, chief project engineer for advanced propulsion systems at Aerojet, died. A few weeks later, I received a joint letter from Kathy Newton, Ron's wife, and Paul Valentine, '55, a friend of Ron's. Here are some brief excerpts: "A young red oak tree, given by Pratt & Whitney, was planted outside an engineering building at Aerojet in Ron's memory. Ron was instrumental in the first-ever consortium of competitors—Aerojet, P&W, and Rocketdyne—formed to develop the propulsion system for America's next generation space transportation system. We know that Ron would like the oak tree to be a living symbol of the vision that our future on this planet depends on the ability of people of differing views, races, cultures, and nations to cooperate and work together." To which we add an "Amen." Over and out.—**Mike Brose**, secretary, 1298 Hartford Turnpike, #1-L, North Haven, CT 06473

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Please send news for this column to: **Allan S. Bufferd**, secretary, Office of the Treasurer, MIT, 238 Main St., Suite 200, Cambridge, MA 02142

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From **Martin Wohltmann** comes a short note "to say hello to John Martuccelli and Profs. Bicknell, Larrabee, Hofman, and Pian. With their instruction I've had a good life. My thanks to them."

Joel Winett who lives in Framingham, Mass., writes that he is the regional chairman for MIT's educational counselors. Joel notes that educational counseling is a good way to keep in touch with MIT and the current students. (Your secretary seconds that. I continue to be amazed at the breadth and depth of the students I interview. Like many of my counselor associates, I often wonder if I could make the cut today.) . . . I have received word that **Thomas Pyle** has resigned as president and CEO of the Harvard Community Health Plan in Brookline, Mass.

Charles McCallum has been named managing partner and CEO of the Warner, Norcross, and Judd law firm in Grand Rapids, Mich. Charlie has been



Charles E.
McCallum

with the firm since 1964 specializing in corporate law with a focus on international law, mergers, and acquisitions. He is active in Grand Rapids civic activities including serving as chairman of Butterworth Hospital, chairman of the Transit Authority, and president of the Grand Rapids Art Museum. Our best wishes for continued success.

James Cobb, a professor in the University of Pittsburgh's Department of Chemical Engineering has been named a Fellow of the American Institute of Chemical Engineering. In honoring Cobb, the Institute cited his expertise as an educator and researcher in zeolite, catalysis, coal gasifier modeling, and the beneficial use of incinerator ash. Jim has been on the Pitt faculty for 22 years, and for the past 12 years has served as director of Pitt's Energy Resources Program. Prior to joining the Pitt faculty, Jim served in the Army, and worked in the Esso research labs. Congratulations from all of us, Jim.

MIT professor **John Southard** had been named among the first six MacVicar Faculty Fellows. John is professor of earth, atmospheric, and planetary sciences and will hold a ten-year term as faculty fellow and receive a \$5,000 annual research grant. The fellows program honors the late Margaret MacVicar, '65, who was dean for undergraduate education.

On March 6 (I'm writing this in late March), I had the privilege of attending the Pentagon ceremony for **Robert Walsh**, who retired as a colonel in the Judge Advocate General's Corps of the Air Force Reserve. Bob, who in civilian life is a patent lawyer for Allied Signal in Phoenix, Ariz., was awarded a Legion of Merit for his Air Force achievements. His retirement decreases my opportunity to meet with classmates as they pass through the Pentagon. To my knowledge, as of this writing **Robert (Rusty) Troth** is the only classmate still serving, and I believe Rusty is planning to retire this summer. Please let me know if I'm wrong on any or all counts.

Finally, I sadly and belatedly report the death of classmate **Joseph Arndt**, who died on July 25, 1989, in Newberg, Ore. Our sympathy goes to Joseph's family.—**Frank A. Tapparo**, secretary and class agent, 15 S. Montague St., Arlington, VA 22204

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Please send news for this column to: **Andrew Braun**, secretary, 464 Heath St., Chestnut Hill, MA 02167

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When the first returns were reported from Dixville Notch in the New Hampshire primary, we noted that **Andre Marrou**, received more votes as the Libertarian candidate for President than George Bush received on the Republican side. I guess Andre spent the winter campaigning in the right place to get those early returns. A former state legislator from Alaska, Andre is stressing personal freedom, repeal of the federal income tax, self-responsibility, and "wholesale cutting" of the federal budget. His vice-presidential running mate is Nancy Lord, who ran for mayor of Washington, D.C., in 1990. His campaign has received coverage in the *Portland (Maine) Press Herald*, *Manchester*

(N.H.) *Union Leader*, and the *Maine Campus* (Orono, Maine).

Classmate **Sherwin Greenblatt**, president and CEO of Bose Corp., was interviewed in the *Middlesex News* last fall. Sherwin is chairman of Framingham State College's board of trustees and also serves on Governor Weld's commission reviewing the 29 state and community colleges in Massachusetts. He is committed to the concept that public colleges should offer "the type of education that will prepare students for the working world." He believes that public education can only improve "through progress and change." Sherwin began his professional career as the first employee of former MIT Professor Amar Bose, '51, when he started Bose Corp. in 1964. Success came in 1968 with the development of the "901 Series" loudspeaker. Today, Bose is one of the leaders in speaker technology throughout the entire world.

Bill Koch keeps making headlines on the America's Cup circuit as his "high tech intelligence" systems provide inside information on his sailing competitors. The *New York Times* did a feature on Bill's "spy systems" and the controversy surrounding these tactics. Bill's methods don't seem to bother Dennis Conner as much as they do the International Challenger set. At this point it looks like it's all paying off, since *America₃* has a significant lead in the defender trials. What we want to know is where Bill came up with the huge bronze lawn ornament dubbed "Roseanne" by his neighbors in San Diego? Shades of Peter Paul Rubens.

Let me hear from you even if you didn't attend the 30th Reunion to "whoop it up" with the Class of 1962. Please send a note to: **Hank McCarl**, secretary, P. O. Box 352, Birmingham, AL 35201-0352

63 30th Reunion

Folks, first some old business. Somehow the February/March column never got in. (Maybe I forgot to mail it, or whatever.) **Tom Gerrity** is now on the board of Fanny May (the Federal National Mortgage Association) and more recently joined the board at Digital Equipment. . . . **Martin Fleischman** has been a Maine psychiatrist for 18 years but now lives in Pittsburgh and works as a consultant in a law firm that does medical malpractice cases. He has four children (9-25), and his wife, Martha, is an educational consultant. In September I joined (part-time) a local HMO with some 250 care providers. I do PC spreadsheet and database programming and analysis. I have also kept open my free-lance PC training and programming practice.

Robert Gilbertson has resigned as president and CEO of Dataswitch of Shelton, Conn., but remains on the board. . . . **Ed Dudewicz** has received the 1990 Saaty prize for a paper he wrote with some others. It is called "Statistical Analysis of Magnetic Resonance Imaging Data in the Normal Brain. . ." Ed is editor-in-chief of the *American Journal of Mathematical and Management Science* and is a professor at Syracuse. . . . **Robert Bolus** has joined the Army Corps of Engineers in Hanover, N.H., specializing in image processing. He was formerly a professor at Norwich University.

Elliott Bird writes: "I must be in a rut of some kind. I've never been busier, but I have little new to report. I give lots of talks, have a few papers (elementary mathematics education) about to be published, may become involved in a K-8 math supplement, still run (except in cold, because of asthma), and travel to Hawaii in winter, France in summer. Not a dull life, but the story becomes repetitive at this age. Miss my friends from MIT."—**Phil Marcus**, secretary, 3410 Orange Grove Ct., Ellicott City, MD 21043, (410) 750-0184, CompuServe 72047.333, Internet: 72047.333@compuserve.com

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Less than two years till our next reunion! Start saving those frequent flier miles and plan on being there.

Speaking of frequent fliers, a postcard came in from Sylvia and **Jerry Weiner** depicting the Palace Museum in Beijing. They were in China on business for two weeks. Jerry noted that e-mail wasn't available so he had to resort to the old-fashioned way of communicating.

Don Alusic sent a note with his Alumni/ae Fund contribution. He continues to work for Digital Equipment Corp. in their VMS Systems and Servers Group focusing on customer programs. Don describes himself as very grateful for all that he has learned and been able to do in almost 25 years at DEC. The Alusics are living in Amherst, N.H. Sophia works in the admissions and guidance departments of a local private high school. Their children—Erika (24), Lorin (19), and Chris (18)—are "either out of school or working to bankrupt their parents as they move through school."

Mike Godfrey was transferred by his employer, Union Pacific RR, to Milpitas, Calif., in January 1991. He is now the night trainmaster at the Milpitas Yard and on the San Jose Branch. He characterizes it as a big change after 14 years in the UP's headquarters in Omaha. For the previous four years, he had worked on the UP's quality program; getting to implement it in a front-line field organization is more challenging and rewarding according to Mike. Mike and Edith enjoyed several visits with Dale and **John Reed** last year while John was on sabbatical at Stanford. The Godfreys have made their home in Livermore and are hoping to meet other fellow alums in northern California.

Bob Weinberg is among ten U.S. scientists and five European scientists selected to receive the Christopher Columbus Discovery Award in Biomedical Research. He was selected "for pioneering studies leading to the identification of a gene capable of converting normal cells into cancerous cells, thereby laying the groundwork for understanding cancer as a genetic disease."

The new national president of the United States Sailing Association is **Robert Hobbs**. His previous positions with the USSA include VP, chair of the Olympic Steering Committee, the Committee on Eligibility, and the Race Administration Committee. His "day job" is as a senior scientist at United Technologies Research Center in East Hartford and he is a resident of Vernon, Conn.

Now here's a great idea! **Michael Monsler** sent along a copy of the Monsler family holiday letter with picture. Michael is in his sixth year at W.J. Schafer Associates, an advanced technology consulting company with contracts in fusion energy research and applications of superconductors. He manages the San Francisco operation which is about to expand into new office and laboratory space in Livermore. In his spare time, he is into economic modeling of financial markets and is now risking real money speculating in foreign currencies, T-bonds, etc. According to Michael, the Monslers are not yet in any great danger of sudden wealth—and that not losing while learning is considered a triumph. Barbara (Wellesley, '65) is in her second year of graduate work at Cal State Hayward pursuing a degree in counseling and psychotherapy. Eric (22) is scheduled as a June '92 graduate of UC San Diego with a degree in systems and control engineering and with plans to get a job



Karin, Michael ('64), Barbara and Eric Monsler

for just long enough to make sufficient money to travel around South America for several months. Karin (20) has finished her junior year at Wellesley majoring in economics and political science. Her junior year included a semester abroad in Brussels.

Hooray for the Monslers for finding a relatively painless way to communicate with your faithful scribe. Next holiday season, all of you who write letters to send with your greeting cards are welcome to send me one and I will excerpt as space allows.

I am getting over a serious case of telephone ear. The Foundation for Informed Medical Decision Making (which I run) received major mentions in the *Wall Street Journal* and *Fortune* over a two-week span. The number of inquiries has been incredible. Happily, there's a little rest in the future. Louise and I are about to head off to Hawaii for a bit of "lava ball" on a few fine golf courses. Aloha!—**Joe Kasper**, secretary, RR 2, Box 4, Norwich, VT 05055

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I would like to encourage all Boston area classmates to note that the MIT Club of Boston will feature the **Margaret MacVicar** Fellows in a series of five dinner lectures during the 1992-93 academic year. MIT President Charles Vest recently announced the appointment of a series of multi-year academic awards, to be entitled MacVicar Fellows, for faculty with special strengths in teaching.

I recently had the pleasure of breakfasting with **Sheldon Apse**. Sheldon is the president of Micrologic, a privately held company that develops and manufactures high-volume, high-technology communications equipment. One product has been the Lofak security system. . . . **John Golden** called to bring us up to date with his latest company. John is managing the start-up Microcor, a Lincoln Laboratory spinout in the area of microlasers. . . . **Dick Schmalensee** continues to report additional activities since his return from service on the President's Council of Economic Advisors. He recently joined the board of directors of Long-Island Lighting.

I had a fascinating conversation with **Roger Wright**. Roger is now director of the High Temperature Technology Program at RPI and a professor of materials engineering. Because of my own interest in advanced materials technologies, I enjoyed coming up to speed on the work he does on physical modeling in a process context.

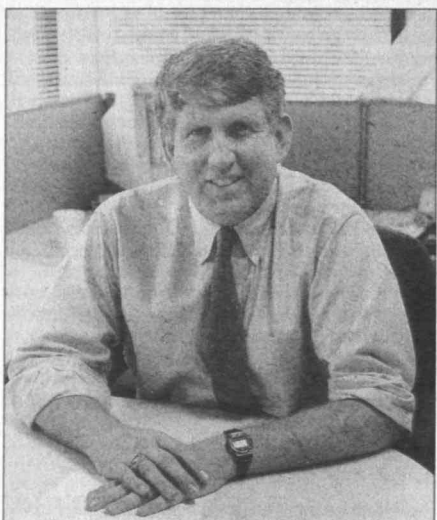
Roger's wife, Patricia, and he have a daughter Sydney (17) and a son Evan (15). Roger made an observation I have heard several academics repeat—that the incoming students are indeed broader in their interests but are also weaker in mathematics—entering students who have trouble with algebra.—**George McKinney**, secretary, 33 Old Orchard Rd., Chestnut Hill, MA 02167, (617) 890-5771

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I received just one postcard this month. **Edwin Meyer** was on holiday in St. Petersburg, Russia, and sent his greetings. I'm sure there are others out there taking equally exciting trips and doing other noteworthy things. Share them with us.—**Eleanore Klepser**, secretary, 84 Northledge Dr., Snyder, NY 14226

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I enjoyed a telephone conversation with **Bob Hewitt** recently. Bob is vice president of finance for Newport Corp., a company he joined five years ago, following 17 years with General Electric. About a year ago Newport acquired Micro-Control, a French business near Paris that provides high-precision, motion control equipment. As a result of this acquisition, Bob has been spending about half of his time in Europe. In addition to brushing up on his French, Bob spends his spare time jogging, playing



Robert M. Metcalfe, '68, is the new publisher and CEO of InfoWorld, a newsweekly for corporate PC managers. The appointment brings together two well-known MIT entrepreneurs: Metcalfe invented the Ethernet local-area networking technology and founded 3Com Corp., while Infoworld is a publication of the International Data Group (IDG), whose founder and chairman is Patrick J. McGovern, Jr., '59. (IDG is a Boston-based company that puts out 178 computer-related publications worldwide and offers research, information, and exposition services.) The new post is a continuation of a career direction that Metcalfe has been developing for the past two years, writing magazine articles, newspaper columns, and a book on Ethernet.

racquetball and squash, and attending the theatre. His wife, Susan, is a systems analyst for Immigration in the Department of Justice. Their daughter Melissa, 18, attends a community college, and son Michael, 15, is in high school. Bob was unable to attend our 25th Reunion due to a board meeting in Paris. . . . I enjoyed lunch with **Jerry Tomanek** who is president of Bedrock Capital, a company in Palo Alto, Calif., that provides investment management services for moderate net worth individuals. Jerry is quite active in community affairs; of particular note, he is a trustee of the Stanford Business School Trust and president of the University Club of Palo Alto. His wife, Susan, also a graduate of the Stanford Business School, is executive vice-president of Wells Fargo Nikko Investment Advisors, which manages \$90 billion in assets. Their son Stuart, 16, and daughter Gretchen, 14, attended Menlo School, and Jerry and Susan have entered that white-knuckle period in which their son has begun driving by himself.

I received some more news (and a good lunch) from **Ed Radlo**, whom I wrote about a few months ago. Ed is very active in ham radio and has contacted all 323 "active" countries, except for Uganda and Bhutan. A few years ago he was 12th in the world in the CQ world-wide competition (i.e., continuous wave Morse Code). His wife, Patty, is quite active in civic activities, including service on the executive board of the Stanford Music Guild. Graham is almost 2, and Heather is 12. . . . **Bob Howard** joined us for dinner at our home during a

business trip a few months ago to Northern California, and, as always, we had a good time and I received news about other classmates, many of whom are finding time to go back to school. One of these is **Jon Sussman** who also joins Bob on the board of directors of the MIT Club of Miami. Jon is a VP of manufacturing for a Racial data communications division headquartered in southern Florida, and he is working on his MBA during weekends. His wife, Margie, is a professor at Miami Dade Community College. Their oldest daughter just graduated from Tufts, and their youngest daughter attends the University of Pennsylvania. Their son is in high school.

To expand the Club of Miami's activities, Bob and Jon invited **Bill Thilly** to give a talk in April about the real causes of cancer. Also invited were all Miami area high school seniors who had been accepted by MIT, as well as their parents. It's hard to think of a better representative for MIT than Bill Thilly. Bill, now an MIT professor of applied biology, has been at MIT since our freshman year and has a wide range of interests and skills. In representing MIT he is a Renaissance man, and I suppose his wrestling skills could persuade any "on the fence" high school senior to choose MIT.

Bob Howard also sees **Eric Coe** and **Lou Offen** from time to time. Eric practices internal medicine in Leesburg, Fla., and has a great time running a tennis clinic for his five sons. Lou Offen, a medical doctor, attends law school in the evenings and works for a U.S. government agency that oversees vaccines. His wife, Laura, helps to raise funds for a number of charities. Their daughter recently had her bas mitzvah.

Tom Grove has been promoted to associate professor of anesthesiology at UCLA School of Medicine. . . . **Larry Aronberg** practices podiatry in Lake Worth, Fla., and is on the American Board of Podiatric Orthopedics. —**Sharlotte** and **Jim Swanson**, co-secretaries, 878 Hoffman Terrace, Los Altos, CA 94024

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The news this month is plentiful, thanks to a significant outpouring from MIT's clipping services. Many of you have given us good reason to be proud.

The Transportation Research Forum has honored **Carl Martland** with the Herbert O. Whitten award "in appreciation for years of outstanding service and dedication" to the organization. Senior research associate in the Department of Civil Engineering and recipient of awards three years running for the best rail paper presented to the annual conference, Carl is a past president of the Forum. . . . MIT has appointed **Alan Guthas** the first to hold the newly established Victor Weisskopf Professorship in Physics. This honor recognizes the special skills that Alan shares with Professor Weisskopf: communicating science to the lay person. . . . In the entrepreneurial collaboration department, **Tom Sciacca** and **Neil Slavin** have founded Intelligent Energy Systems, Inc., in Westford, Mass. This company makes small power plants that use cogeneration technology and are designed for installation in the home. . . . Politically speaking, **Russell Bjork** has received the endorsement of the *Salem Evening News* for election to the school committee. Good luck, Russell! . . . The National Academy of Engineering has announced the election of **Stewart Personick** as a member of the academy. Stewart works for Bell Communications Research in Morristown, N.J., and was cited for his work in fostering the theoretical and practical applications of optical and electro-optical sensors.

George Phillis has taken a sabbatical from his work at WPI to really relax—he plans to research complex fluids and statistical mechanics and write a textbook. . . . A cryptic mini-note from **Donald Batchelor** reports his selection as a Fellow of the APS. . . . The major correspondence award goes this month to **Barry Mitnick**. Barry continues to teach in the University of Pittsburgh business school, and has been busy finishing a book of papers that apply

the agency theory approach he independently originated some years ago to corporate political activity. He writes proudly of his three children and reports that both he and Margy are very involved in school and community activities. During this past summer he had 14 Hungarian students in his class, among the first from their country to earn MBAs. Though they all spoke English, they needed lots of "interpretation" regarding the U.S. government and business setting. He still enjoys photography and writing an astronomy column for a local paper.

Ken Morse is reunion chairman for our 25th Reunion. More information will be available in the August September issue. If you have suggestions, he would like to hear from you. Ken can be reached at 65 Greylock Rd., Wellesley Hills, MA 02181; work phone: (617)497-9010, ext. 306 (24-hour voice mail); fax (617)497-7806.

Looking forward to reporting your news next time. Your ad hoc secretary.—**Rick Lufkin**. Please continue to direct your correspondence to **Gail and Mike Marcus**, secretaries, 8026 Cypress Grove Ln., Cabin John, MD 20818

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Please send news for this column to: **Eugene E. Mallove**, secretary, 171 Woodhill-Hooksett Rd., Bow, NH 03304

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We have a report that **Ted Williams**, president of Laserlight Systems, Inc., in Dedham, in December 1991 received the Richard R. Dilling award from Automatic Identification Manufacturers, Inc. Ted received the award for his innovation in bar code scanning technology. . . . **Don Anderson** has been promoted to senior scientist at Woods Hole Oceanographic Institution. An expert on "red tide," Don has been chairman of the United Nations' Intergovernmental Oceanographic Commission Group of Experts on Harmful Algal Blooms since 1989. . . . **Jeff Gale** tells us that things are going pretty well for him as a professor of business administration at Loyola Marymount University in Los Angeles.

Please keep in touch.—**Greg and Karen Arenson**, secretaries, 125 W. 76th St., Apt. 2A, New York, NY 10023

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Peter E. Brumme is VP-sales and marketing of Software Developer's Co. in Hingham, Mass. He was formerly senior VP of Microcom, Inc. Please send me your news.—**R. Hal Moorman**, secretary, P.O. Box 1808, Brenham, TX 77834-1808

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Mark Goodrich, Jerry Shadix, Gordon Shecket, and **Al Yee** had a fine time on a nine-day river raft trip through the Grand Canyon last October. This was their third annual camping get-together, after Yellowstone National Park in 1990 and Olympic National Park in 1989. Next year: kayak school in northern California. . . . Mark lives in Peabody, Mass., with wife Jenny and daughters Roz (12) and Christina (9). He is president of McGrath Inc., suppliers of refurbished high vacuum and optical equipment. Mark still sets up killer cross-ruffs and elegant squeeze plays as in days of old. The Galapagos Islands tops Mark's list for most interesting recent family trip, a side trip from visiting family in Ecuador.

Jerry is in solo architecture practice in Birmingham, Ala., applying energy-conscious design principles and solar-energy systems to commercial and residential projects. He was 1990 president of his American Institute of Architecture chapter. Jerry is still known to make unnatural things happen to a basketball on the court. He and

Al attended the NCAA basketball tournament final four last year. . . . Gordon lives in Worthington, Ohio (Columbus area), with wife Peggy and sons Michael (12) and Jonathan (9). He is associate pathologist and resident computer hacker at Grant Medical Center Laboratories. He enjoys playing bassoon in a community orchestra and chamber music groups, and took up violin last fall. . . . Al lives in Milwaukee with wife Charlene, daughter Jill (10) and son Jay (8). He is director of Emergency Medicine at St. Michael Hospital. In his spare time he is perfecting his tennis serve and stock-market strategy.

Darrell S. Rigel is a dermatologist practicing in Manhattan. He is also a clinical associate professor on the faculty of New York University, doing research in melanoma and other skin cancers. He is a co-author of the recently published textbook, *Cancer of the Skin*. Darrell met his wife, Beth (who attended Simmons), while he was at MIT. They have three children, Ethan (8), Adam (6), and Ashlee (3). Darrell was recently elected assistant secretary-treasurer of the dermatologists' national organization, the American Academy of Dermatology. . . . **Steven Tavan** is very glad to have returned to the Boston area, where he plans to stay for a long time after a year in Melbourne, Fla. He was MITRE Corp.'s site leader there. His children, Ilana (14) and Ethan (11), are thriving.

I am sad to announce that **Lewis Erwin** died unexpectedly in December 1991. He is survived by his wife, Jacqueline Menn Erwin, their three children, Eleanor, June, and Will, as well as his parents and siblings. He taught as an associate professor at MIT, and at the time of his death was the director of the Center for Manufacturing Engineering at Northwestern's School of Engineering and Applied Sciences. He was also active in his church and became known around Winnetka, Ill., as "the bicycle man." The moniker came from the fact that he harvested broken bike parts on weekends and then rebuilt bikes, which he gave to children who needed them. He also devised an innovative method for applying heat shielding to the space shuttle's external fuel tanks. He received the 1977 Ralph R. Teeter Award of the Society of Automotive Engineers and the 1981 Outstanding Young Manufacturing Engineering Award of the Society of Manufacturing Engineers. He accomplished many things in his short life. I'm sorry it took his death to learn of some of them.

Hannah Fingeret went to Germany in December as the keynote speaker to a group about adult literacy. She continues to work with Literacy South, based in the Raleigh/Durham area, which works on increasing the literacy rate among adults. Sometimes we forget that adult illiteracy is still a very important area of need in this country. (I believe I read that 20 percent of adults in America are illiterate.)

By the time you read this we will have had our 20th Reunion. I hope that I will have seen many of you there. If not, please send news about yourself and your doings that can be included in the next class notes. After the reunion I hope to be off to France for the summer and part of the fall, but our cosecretary, Dick, will be happy to hear from you. — **Wendy Elaine Erb**, co-secretary, 6001 Pelican Bay Blvd., Apt. 1003, Naples, FL 33963; **Dick Fletcher**, co-secretary, 135 West St., Braintree, MA 02184

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Edward Elliott is in private practice doing general psychiatry in Santa Monica, Calif., and getting married this June. . . . **David Bernstein**, a specialist in transportation research, was appointed to the Mitsui Chair in Civil Engineering at MIT this past February. His specific area of interest is in congestion pricing, network equilibrium models, and geographic information systems.

For all my 17 years as your secretary and correspondent, it has been an "in joke" that classmate offspring get their prospective class years appended to them. For the first time, it's a bit less funny as my older son Eric has been admitted to

two (so far) universities from which to choose for the fall. He'll be a real '96 somewhere and, though it won't be MIT, I'm still very proud of him. Write! — **Robert M.O. Sutton, Sr.**, secretary, "Chapel Hill," 1302 Churchill Ct., Marshall, VA 22115

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Please send news for this column to: **Lionel Goulet**, secretary, 115 Albemarle Rd., Waltham, MA 02154-8133, (617) 899-9694

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Here's the news: **Lena S. Sun** is a pediatric anesthesiologist at BHOR, Columbia Presbyterian Medical Center in New York City. . . . Early in 1992, **Carlos A. Riva** became president and CEO of J. Makowski Co., Inc. (and its subsidiary, J. Makowski Associates), One Bowdoin Square, Boston, Mass. . . . **Saleh Daher, Jr.** writes, "I and I now have two daughters, Laura, 6, and Grace, 2. We are having great fun raising them. I continue to make a lot of money for my investors by buying debt of third-world countries. Panama and Nigeria have been great performers." Thanks for the tip.

I've learned from a clipping from the November 20, 1991, *Hartford Courant* that **Jim Okun** is active in an environmental group in Stafford, Conn., called "Citizens Opposed to a Radioactive Environment." He is a member of the group's technical committee and has been opposing the location of a low-level radioactive-waste dump in Stafford. Jim, according to the newsclip, is VP of GZA Geo Environmental, a company that assists businesses nationwide in the management and clean-up of hazardous waste. He also worked for the U.S. Environmental Protection Agency in hazardous waste site investigation and clean-up. That's it for now. Keep in touch. — **Jennifer Gordon**, secretary, 18 Montgomery Pl., Brooklyn, NY 11215

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Ed Crawley is one of six professors at the Tute to be awarded one of the first MacVicar Faculty Fellowships. These fellowships are in recognition of exemplary and sustained contributions to undergraduate education, and were established in memory of the late Margaret L.A. MacVicar ('65), former dean for Undergraduate Education.

From **Marsha A. Lavoie**, MD: "For those who haven't heard, my marriage to **Larry Hardy** ended in divorce. I am happy now to be remarried. My new husband is Jonathan Logee, a native of Woodstock, Conn., and a self-employed metalsmith. We will reside in Worcester, Mass. Professionally, I continue to be a staff/faculty physician at the Family Health and Social Service Center at Worcester—a community health center serving 'the underserved' innercity population. I hold an assistant professor position in the Department of Family and Community Medicine at the UMass Medical School, as I am involved in teaching medical students and family practice residents."

The above represents all the news I have. In order to stimulate some of you to get in touch and provide some information, I am inaugurating a new section entitled, "Where are they now?" For various reasons, we have lost touch with a significant number of classmates. If anyone has an address (business or personal) or phone or fax number for any of the following people, please pass it along so we can contact them. I will publish names in each issue; there are far too many to do all at once. So, where are: **Olaleye Aina**, **John Alexander, Jr.**, **Joan Allen**, **Susan Anderson**, **Michael Ariel**, **John Arnett III**, **Andrea Barton**, **Gary Benson**, **Ava Berinstein**, **Don Blasius**, **Richard Boschen**, **Paul Bradford**, **David Breitman**, **Jeremy Broner**, **Gary Brown**, **Joel Buckley**, **Thomas Bunch**, **Vicki Mattson Cairns**, **Harold Caldwell**, **Caniel Capon**, **Brent Carson**, **Paul Carter**, **Ralph Chang**, **Kwong Man Cheng**, **Wesley Cobb, Jr.**, **Cecil Compeau, Jr.**,

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Demetrious Condyllis, Kenneth Cone, Stephen Corteselli, John Curtis, Gary Cuscino, Gina Dallabetta, Barry Dankovich, Claudia Davidoff, Linda Davis, and Alfonso De Benedictis? I assure you, this is only a small part of a distressingly large list.

As for your secretary, I am still plugging in my high tech world. One problem I have noticed is the speed at which technology has outdistanced most people's ability to understand and absorb it. Having gone to the 'Tute, I believe has given us a distinct edge when it comes to both keeping abreast of, and mastering, new technology. Please write, fax, or call. We urgently need news.—**Arthur J. Carp**, secretary, Quantalytics, Inc., 220 Henley Rd., Woodmere, NY 11598-2523, (516) 295-3632, fax: (516) 295-3230

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Greetings, classmates! Although this issue comes to you after the 15th Reunion, I am writing this column on an unseasonably cold March day. Therefore, I have no news/gossip for you from the reunion as yet. Stay tuned to this space in future issues to catch up on that big event.

I have the unhappy duty of reporting to you the death of **Roger L. Renshaw** on January 27 of this year. Though officially a member of the Class of 1979 (when he graduated), he entered with our class in September of 1973 and considered himself a member of our class. We extend our sympathy to his wife, **Joan M. Hughson**. . . **Frederick M. Rust** joined the Federal Reserve Bank of New York in the spring of 1991. He is working on funds and securities transfer systems. He reports that this is a return to systems development for him after seven years in marketing and strategic planning, and he's very pleased with the switch back. . . . After experiencing recurring restlessness on the General Motors financial staff, **Julia Malakie** went back to

school at Syracuse to study photography. Since 1988 she has been working as a photographer for the Associated Press in Boston, the *Lowell Sun*, and freelance. Julia writes, "It might not have a lot to do with my education (except for working on *The Tech*), but I'm really having fun. Plus, as someone whose favorite spectator sport is politics, I feel unbelievably lucky to have a local presidential candidate two elections in a row." Well, we hope that Julia continues to have plenty of photo ops now that Paul Tsongas is no longer in the presidential race. . . . **William Poundstone** is the author of a new book from Doubleday, *Prisoner's Dilemma*. The book jacket describes the work as a biography of John von Neumann woven together with the history of the cold war and an investigation of game theory's influence on public policy. His other books include *The Recursive Universe*, *Labyrinths of Reason*, *Big Secrets*, and *The Ultimate*.

Well, I certainly feel middle-aged, how about you? I've turned 36; I've joined the PTA; I've grown a number of pigment-free hairs; and I've noticed a lot of clothes that have mysteriously shrunk around the waist. Soon, when my oldest child fits into my clothes, the transformation will become complete. Is anyone else having these adult feelings? (I ask while humming "I don't wanna grow up, I'm a Toys-R-Us kid.") Remember, my friends, 15 years since graduation means 19 years since those younger versions of ourselves gathered on the Great Court for the Freshman Picnic. We, the Institute, the world at large, have all changed. I hope in some future issues you will share with us how these last 15 years have treated you. Write to **Ninamarie Maragioglio**, secretary, 8459 Yellow Leaf Ct., Springfield, VA 22153-2522

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Scott Griwsold writes us from Dubai, United Arab Emirates: "I have worked with the oilfield services

15th Reunion

company of Schlumberger since graduation. I am currently a field operations manager in Oman, with assignments in South America, Europe, and the Middle East."

Vince James who is the classmate with the most enthusiasm about MIT that your class secretary knows, has been appointed director of the MIT Educational Council and associate director of admissions. Vince has been involved with MIT in many ways—as a member of the Educational Council for ten years, and member of the Alumni Activities Board and Technology Day Committee. Before this appointment at the 'Tute, Vince was at Bankers Trust in New York where he was a systems leader in the MIS department.

Vince's news must, of course, be accompanied by a plug for the Educational Council! It is a great opportunity to do public relations for the 'Tute. The primary part of the job is to interview high school seniors for MIT admission and submit an assessment of each applicant's ability to succeed at MIT and to contribute to student life. Some educational counselors even go to high schools to talk with students who are prospective applicants. If you are interested, you can contact Vince at the Educational Council Office at MIT (Cambridge, MA 02139, for those of you who've forgotten!).

Bill Kuttner writes, "I've just received an appointment to the Massachusetts Central Transportation Planning Staff to do traffic modeling for Boston's well-publicized 'Big Dig.' Bill lives in Charlestown. (Your class secretary fondly remembers civil engineering students saying how traffic flow normally is modeled in a computer as lamellar flow, but in Boston it is modeled as turbulent flow!)

Steve Kirsch has been busy in San Jose: "On February 12, the high tech company that I started six years ago went public. The name of the company is Frame Technology Corp. and we make a sophisticated document publishing software package called FrameMaker. The company now

If it weren't for ProNet, I wouldn't have this job. I applied for a position and didn't hear anything. At the same time my resume came up on a ProNet search for that job. The search resulted in an interview for me... and the job I really wanted. ProNet made the difference.
Mark Peters '87
West Palm Beach, FL

Whether or not you're currently looking for a job, people do make offers you can't refuse. The MIT ProNet service is designed to keep you abreast of challenging opportunities in a variety of fields, including: High-tech, Venture Capital, Fortune 500, Start-ups, Bio-tech, Aerospace, and many more.

It's easy and it's confidential. For more information write: MIT ProNet, Registration Department, MIT Alumni Association, 77 Massachusetts Avenue, Cambridge, MA 02139.

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employs over 300 people worldwide and our revenue last year was just over \$40 million. I'll be using some of the proceeds from the IPO to donate back to MIT. My goal is to make a dramatic improvement in the relationship skills area. It has always bothered me that when I left MIT, I had one thousand times more technical skills than I needed, yet my 'people skills' were exactly the same as when I arrived—no change in six years. The situation today at MIT, 12 years later, is virtually unchanged." Our congratulations go to Steve and we wish him well with his pursuits at the Tute.

Ken Cameron piloted the shuttle *Atlantis* in April 1991. That mission featured the launch of the Gamma Ray Observatory and a number of extravehicular activities. Readers may remember the mission for the unplanned extravehicular efforts required to deploy the high-gain antenna—finally loosened when a member of the crew stood on it and pushed. Part of the mission included ham radio sessions with earth-bound radio enthusiasts. Ken also noted that the smoke from the burning Kuwaiti oil wells was remarkably visible from orbit.

Class president **Milton Royce** sends us information about the students who are currently receiving financial aid from the Class of 1978 Student Aid Fund:

Shannon Moynihan is a junior from Hudson, N.H. She is working toward a double major in aero/astro and biology. **Shannon** manages the MIT Volleyball Team, is an officer in her sorority Alpha Chi Omega (yes they have sororities at MIT now!) and serves as the VP of the Pan Hellenic Conference. She is trying to get her pilot's license on the side. Her career plans involve a future in the space program, and she is considering medicine as a way of pulling together all of her many interests.

Reuven Lerner is a senior in computer science from Old Westbury, N.Y. Reuven is the news editor for *The Tech*—a job he estimates requires 40-50 hours per week. He is also involved in two Jewish student organizations in which he holds leadership positions. He plans on a career in computer science unless the pull of journalism is too great!

Many thanks to all of the classmates who have contributed to the Class of 1978 Student Aid Fund. The students who receive the assistance really appreciate it.—**Jim Bidigare**, secretary, 9095 North Street Rd., NW, Newark, OH 43055-9538, (614) 345-8582

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I got a long letter from **Jim Lester**. Jim and his wife, Margie, have been living in Greensboro, N.C., since 1987. Jim is a partner with the international law firm of Patton, Boggs & Blow, as an arbitrator and mediator of commercial disputes in the litigation and technology law group. The Lesters have two children, 8-year-old Katie and 4-year-old Brian. Jim and several other North Carolina alumni are in the process of forming an MIT Club in the Research Triangle area. . . . **Jonathan Keefe** is the development director for NYNEX Properties and "is busy raising baby Elsa. Still see alumni buddies Tom "Strobe" Ziobro, '80, Jim Wheaton, '80, and Ed Gonzalez. **Steve Tufty** moved back to Oregon with wife Liz and baby Buck."

A couple of items about yours truly. In 1990, I mentioned that I had been awarded the Lobdell Distinguished Service Award for my work as class secretary. Well, the actual award sat in the New York Alumni Center collecting dust until just recently, when the new director of the center found it and tracked me down. I received a nice framed certificate and a beautiful brass clock, which has been attracting a good deal of attention in my office! The other piece of good news is that I am currently rehearsing the lead role in the musical "Oklahoma!" I'm working with the same Off-Off-Broadway theater group with which I have done ten previous productions over the last five years (although we did move to a new space last year). The show will run for three weeks in May. This is a role that I have unsuccessfully auditioned for more than once in the past, and it is a thrill to have the chance to do it at

last. Hope all your news is good news.—**Sharon Lowenheim**, secretary, 98-30 67 Ave., Apt. 6E, Forest Hills, NY 11374

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News of another classmate inspired **Steve Pinkowski** to send his news: Steve and his wife, Aiko Mondori, '82, live in Sudbury, Mass., with their daughter Alissa (2) and Aiko's mom. Aiko works at Epoch Systems and Steve is at Digital. . . . **Darrell Hartwick** writes that he is working at Candela Laser Corp. in Wayland, Mass., where he has the "rather cumbersome" title of optomechanical biomedical engineer. . . . Looking for **Susan Lee**? Start at the Massachusetts School of Professional Psychology. If she's not there try the BU Mental Health Center where she counsels students 27 hours a week. . . . I received a copy of an editorial from the *North Shore Sunday* (Ipswich, Mass.) discussing the candidates for mayor of Salem. **Mike Johnson** was running against the incumbent. No word on the outcome.

What did you do on your summer vacation? Send your story to: **Kim Zaugg**, secretary, 2384 Leslie Circle, Ann Arbor, MI 48105, (313) 665-2365, vayda@erim.org.

81

This month's news takes us to the other side of the world and out to the edges of the known universe.

Home sweet home. **Thomas Semple** has finally settled down and bought a house after 11 years of apartment living. He's living just south of Houston near Galveston Bay and the NASA area. From this vantage point, Tom gets to see the Space Shuttle landing at Johnson Space Center on its way back to Kennedy Space Center in Florida. Tom further informs us that he's been working for Shell Oil for the last four years, and has kept up with **Peter Jernakoff** and **Kevin Bowie**. Finally, Tom's interested in obtaining classmates' BITNET or INTERNET addresses. Any '81s who would like to hear from Tom can send their addresses in to me and I'll pass them on.

Capital asset. . . . As noted recently in the *Wall Street Journal*, **George Dowd** was one of four top specialists in mortgage-backed securities to assume new positions at Alliance Capital Management in New York City. George was named a VP in the Fixed Income Research Department. Prior to his latest move, he held positions as a VP at Hyperion Capital Management, Inc., president of IMT Equities, Inc., and did a stint at The First Boston Corp. George is now living in Fairfield County and reports the birth of his third child last December.

Seoul man: **Thomas P. Garigan** is heading for Korea for a one-year assignment starting about now, July 1992. He expects to have graduated from residency in family practice this past June.

Cosmic thing: We are informed that **James Mahoney**, professor of physics at Marlboro College in Marlboro, Vt., recently conducted research at the Goddard Space Flight Center, having received a highly prestigious Summer Faculty Fellowship from NASA. James' research involved analysis of data from the Cosmic Background Explorer (COBE) satellite, which collects microwave radiation remaining from the Big Bang.

Until next time, enjoy the summer. I'll be waiting for your signals.—**Mike Gerardi**, secretary, 1515 S. Flagler Dr., #1204, West Palm Beach, FL 33401, (407) 655-5050 (w), (407) 835-9013 (h)

82

David Andre reports that he is busy managing PC Product Development at Object Design, Inc., in Burlington, Mass., and was married last July. David had news on some of his friends. . . . **Andreas Hofman** works at Gensym, Inc., where he was a founder, and is now the father of a baby boy, Christopher. . . . **Ann Close** was married to Michael

Good ('79) last October and is working at Analog Devices, where she is enjoying life as an integrated circuit designer. . . . **Joy Pape** would like to be at the reunion, but is happily expecting a baby in May. . . . **Karen Perizzolo** received an MD from Stanford last June and is in the process of opening her own internal medicine practice in Los Gatos, Calif. . . .

Alison Kutchins is working in Washington as a White House fellow and will be spending a year as associate director of Cabinet Affairs and special assistant to the Secretary of the Cabinet. She mourns the resignation of John Sununu, previously MIT's highest-ranking alum.

Some news from this reporter. . . . **Michelle Gabriel** is finishing up an MBA at UC Berkeley this May and is planning on getting married in fall '92. . . . **Eve Ahlers** and **Bill Nunan** are the proud parents of a baby boy, Tom. Eve received a PhD from UCLA and now works at TRW, and Bill is finishing a PhD at UCLA. . . . **Elena Rozier** now works for Lockheed in Research and Development and will be getting married in May. She and her fiancé, Jon Gearing, spent six weeks touring Europe on bicycles last summer. . . . **Lucinda Linde** was married last October to Lewis Martin, whom she had met two years earlier on a plane trip. They climbed the Mayan pyramids of Mexico and dove into the depths of Turks and Caicos Islands. She is national sales manager for Molten Metal Technology, yet another MIT startup. . . . **Lina Janavicius** is engaged to Lou Morales and is busily working on a fixer-up house in Somerville, Mass.

Cedric Detmar completed an MBA at UCLA and is now a manager at Oracle. . . . **Eric Leiser** is Far East applications engineer at Allied Signal working on spin-on glass for semiconductor processing. . . . With all of his frequent flyer miles, Eric and wife, Cindy, have been able to travel to Italy and Thailand. . . . **Victor Quintana** is at Polaroid in Cambridge, right next to MIT. He and wife Donna are the proud parents of two girls.

Some reports on the "lost" alums. . . . **Brewster Kahle** may be working for Thinking Machines in Cambridge, Mass. . . . **George Thayer** married **Joan Purdy**. . . . Rather cryptic, but **Joseph Shipman** sent in this note—Jack Florey "Orange Tours."—**Michelle Gabriel**, assistant secretary, 616 San Miguel, Berkeley, CA 94707

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10th Reunion

Richard Zellers was awarded the chartered financial analyst designation by the trustees of the Institute of Chartered Financial Analysts. To earn the CFA designation, Richard had to pass three six-hour exams over three years, as well as adhere to the ICFA Code of Ethics and Standards of Professional Conduct. So the next time you need a financial analyst for a three-, five-, or seven-day excursion, give Richard a call.

Susan Strausman Rietti writes and says that she has been married to Giorgio Rietti for three years and just had their first child, a boy named Luca. Susan is working in the family business and attending to mommy stuff. Recently she and Giorgio attended the wedding of **Betsy Pollack** and Howard Benjamin, '82, in Boston. Susan says that **Sara Henderson**, **Joyce Kelly**, and **Jennifer Hance** also attended, as well as many other MIT alumni from other classes.

Layton Montgomery sent in his annual update. I will try to summarize in order to save trees, and those of you who want to know more can purchase the CD ROM version of Layton's comments. Layton is back from trips to Africa and Asia and is currently working on a master's in education at the Center for International Education at UMass/Amherst. He plans to continue straight on to an EdD or PhD. A strike by the graduate student employees during the recent semester made things a little interesting. Layton adds that he enjoys Amherst, which is of the size that he can get around on his bicycle. He is hoping to avoid getting a car or TV for as long as possible.

Hilton Russell writes that he is looking forward to getting married in May and moving to West

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Point to join the Math Department there. . . . **Hans Griesser** is finishing a degree in MIT's Leaders for Manufacturing Program.

Keep those cards, letters, and stock tips coming.—**Jonathan Goldstein**, secretary, TA Associates, 45 Milk St., Boston, MA 02109

84

Allen Powell is now a resident in radiology at Shands Hospital, University of Florida. Glancing through the class list recently, I was quite impressed with the number of doctors (of various kinds) that we have in the class. Maybe I can get some precise numbers for next time. . . . **Barbara Poggiali** (another PhD) and **David Kuller**, '82, have been living in Italy quite happily for four years now. They travel about six weeks each year and welcome visitors from MIT having already hosted a number of friends from No. 6 Club and Chi Phi.

Lisa Tener is currently the director of a small non-profit called the Hospitality Program. They find housing, in the homes of volunteer hosts, for the families of patients being treated in Boston-area hospitals. Lisa says she loves the job. She recently saw **Sarah Tabler** who is settling into married life and her new Eastgate apartment. Lisa reports that **Stella Hetelekidis** and **John Mark Johnston** have a baby boy, **Alex Cameron Johnston**, who is a year and a half old. . . . **Cathy (Naylor) Brennan** visited Lisa from Seattle last summer and they drove up to New Brunswick, Canada, for the week. Cathy works for Digital in Bellevue. . . . **Brett Jackson** and **Margaret Rakas**, '83, live in Longmeadow and they met Lisa in the fall to enjoy the landscape at the Quabbin reservoir.

Well, somehow I always manage to have a business trip the week before these note are due, so the New Year's report will have to be deferred. Stories of skiing and skating on frozen lakes will have to wait until the middle of summer to carry us through the hot months.—**Howard Reubenstein**, secretary, 28 Mitchell Grant Way, Bedford, MA 01730, (617) 275-0213 (home), hbr@mitre.org.

85

This month bears the first fruit of the active news solicitation effort. First there is the news from **Arline Yen** who diplomatically called yours truly "persistent" after about five follow up phone calls to the letter requesting news. Arline is finishing her third year of residency in internal medicine at UCSD after completing medical school at University of Texas, South Western. She will be starting a fellowship in endocrinology in July 1993, but she hasn't yet decided where. She recently went to Spain and will soon be traveling to Hawaii for vacation. Arline has been too busy to play the piano which helps to explain why she says, "Thank God residency is almost over."

Arline also has news of other classmates: **Christina Stanley** is in residency in pathology at UCSD while **Linda Yang** is an anesthesiology resident in New York. **Mary Petrovsky** lives in San Francisco and is known to spend time challenging river rapids. **Jennifer Chen** is a medical resident at Boston University, and **Anna Hsu** is a medical resident in Minneapolis.

Still no word from **Dan Frost** or **Gary Brown** who have moved from the addresses in my class list.

And now the news that you have all been waiting for—an update on those men in Lycra, the Class of '85 swimmers. **Peter "Panic Pete" Hickman** is living in Michigan. He is working at TRW in a division that makes the sensors that go into bumpers to trigger airbags. For the last six years he has been volunteering as an assistant coach for the University of Michigan Women's Swim Team. The team is very good—in the top ten nationally and six-time Big Ten champions. Pete got married in September 1990 to Lisa. Best Man was Tim Burks, '86, water polo. Also attending were fellow DU swimmers **Mark Larow**, '82; **Jay Hoffman**, '82; and **Lou Martinage**. Kappa Sigma swimmer **Tony**

Koselka, '86, also helped to make the day memorable.

Lou Martinage, another one of **Benedick's Best**, is recovering from knee surgery after an unsuccessful touch football career. Lou is currently working for US Sprint in the D.C. area in a management/sales position. His recent injury may put him back in the water, and he is looking for a medal in the 1996 Olympics in another stroke, "maybe butterfly."

Steve "Hooter" Scherdin reports that he is getting "old and cranky" in Louisville, so bubbly fastfood clerks beware. He actually likes the Louisville area. After five years with TRW in Tennessee he is currently working at Key Communication Services, a maker of intelligent printers and terminals. While in Tennessee he started and coached an age-group swim club. In his spare time he is currently pursuing an MBA at the University of Louisville. Steve has spent less time in California than any living MIT graduate—one weekend for his sister's graduation.

From the Alumni Office news desk: After working in tilt-rotor aircraft research at NASA Ames Research Center for the last six years, **Ruth Heffernan** is leaving to work for U.S. Windpower in Livermore, Calif. While at Ames, Ruth obtained a master's degree in aero/astro from Stanford. She is excited to be working on developing new wind turbines because of her long-held interest in alternative energy. . . . **Caroline Van Rijkkeghem**, having finished a PhD at UC/Berkeley, is now working with the International Monetary Fund in Washington, D.C., on labor and macro-economic issues.

This month's randomly selected Class Secretary Sweepstakes winners are **Deborah Rice**, **James Bittman**, and, ironically, a man from my own living group, **Harry Gries**. (I swear this last one was pure coincidence.) From Berkeley, your ace investigative reporter—**Bill Messner**, secretary, 2234 Jefferson Ave., Berkeley CA 94703, (510) 845-8119, messner@cmls6.berkeley.edu

86

Hello from rain soaked Los Angeles. Don't believe 'em when they tell you it doesn't rain in southern California. Not a lot of news this month and I'm preparing to head off to the Rosarita-Ensenada Bike Race so I'll have to keep it short.

I received a postcard from **Robert Lenoil** with the great news that he is now engaged. Congratulations! His fiancée is **Stella Young**, a UCLA '86 and Stanford '88 grad who works as a financial analyst with Swiss Bank Corp in San Francisco. No wedding date yet, they're still trying to decide where to live. . . . **Jeremy Verba** also sent me a nice letter. From 1986–88 he worked at First Boston Corp. in New York City, where he had a great time. In 1988–89, he backpacked in Southeast Asia, Australia, and New Zealand. From March 1989–July 1991, he worked at Campoon Corp. in Toronto, Canada, which he compares to rearranging deck chairs on the *Titantic*: frustrating and somewhat fruitless. He has finally ended up back in school at Harvard Business School, where he'll be graduating in June 1993. Jeremy keeps in touch with **John Sapirstein** (U/Chicago, surgery internship) and **John Martin** (married with three kids and Stanford Business School).

Stuart Malone, along with a group of MIT researchers, received a Reviewer's Special Recognition Software Award from the EDUCOM Higher Education Software Awards Program. They received the award for A la Recontre de Philippe, a videodisc-based program in which students help the jilted Philippe find a new apartment in Paris. Stuart is a systems programmer in the Program in Writing and Humanistic Studies. . . . **Tony Vizzini** is currently an assistant professor at U/Maryland and will be considered for tenure this year. He has three kids and has been active in his community and church by teaching CCD to high school students for the last five years. . . . **Dan Schmauch** is enjoying life in the Rocky Mountains. He recently had his first child, **Kyle Kristopher**, in January 1992.

Robert Greenfield, after living for almost four years

in Allentown, Pa., will be moving to New York in the fall to attend NYU Law School where he's interested in pursuing a career in patent law. . . . **Dan Kulp** is working hard to finish a PhD in materials science and engineering. . . . **Gregory Berthiaume** received a PhD in astronomy and astrophysics from Penn State College. He was a Braddock Recognition Awardee and a graduate school fellowship recipient. He won third prize at Penn State's Sixth Annual Graduate Research Exhibition and was selected as the recipient of the Wheller P. Davey Graduate Fellowship. The latter was in recognition of his accomplishment in putting a rocket into space, equipped with a payload of his own. Greg will return to MIT Lincoln Labs as a full staff member working with focal-plane infrared arrays. . . . **Ann Sidley** received a doctor of veterinary medicine in May 1991 from Tufts University School of Veterinary Medicine.

Please write! **Mary C. Engebret**, secretary, 1805 Manhattan Ave., Hermosa Beach, CA 90254, (310) 376-8094

87

This month, top honors go to **Andy Gerber** and **Michael Saylor** for sending in the latest news. Prizes will be awarded to the member of the class who sends in the hottest gossip at year's end. Don't miss your chance to be a contestant.

Andy Gerber writes: "**Todd Ogawa** and I have been living together in Denver since mid-1988. Todd graduated from medical school at the University of Colorado in May 1991 and has started a residency program in internal medicine there. I have been working for Solbourne Computer for the past three years, doing 'really neat' things with X, C++ toolkits, and debuggers. We purchased a house together in Denver also in May '91.

"We both enjoy skiing, but this year Todd's internship is making great demands on his time, with 100-hour weeks and 36-hour shifts. Not to worry, as other alumni seem to make it to Denver and I ski with them. **Hal Cohen** was out in late December and we spent a day skiing (well, Hal was on the bunny slope), and **Don Becker** was out in late January and we spent two days at Vail. I had a hard time keeping up with Don (skiing). He works at the Supercomputing Research Center in Bowie, Md., and can't tell me what he does 'cause it's classified. . . . "We also see a lot of Heather Patrick ('88), who is working on a PhD in physics at Colorado University. Plenty of other former East Campus types have made it through Denver in the past two years: **Jonathan Root**, Ellen Baker ('88), Rob Gandara ('86), Tom Wethern ('89), **Simpson Garfinkel**, and Alek Grabinski ('88). I'm sure I'm forgetting someone."

Michael J. Saylor writes: "Greetings to all my classmates. After having worked as a management consultant in Natick, Mass., and New York City for a while, I took a job with Du Pont, eventually rising to the position of venture manager of the Business Strategy Systems group. While at Du Pont, I realized that the mainframe simulation modeling I was doing had become obsolete due to breakthroughs in desktop computing (à la Macintosh), so in 1989 I left the firm to start my own company—MicroStrategy—along with **Sanju K. Bansal** and **Thomas P. Spahr**.

"We are management consultants specializing in the development of decision support systems that seamlessly integrate databases, spreadsheets, and simulation models behind a graphical user interface (GUI). We also sell software tools, such as EISToolKit, which is now shipping on both the Macintosh and Windows platforms. The company is doing well, and is now up to 19 people, including 5 MIT grads. We are situated in Wilmington, Del. (chemical capital of the world), and to celebrate the recent arrival of **Ratnadeep Damle** and **Mickey Wurts**, we hosted the Valentine's Vainglory Party. In attendance were many MIT Theta Deltas, including: Loginn Kapitan ('85), Craig Cohen ('88), Paul Sadja ('88), David Stracher ('88), Timothy Hawkey ('88), Steven Kishi ('89), **Michael Levin** (with wife Heidi Eigenrauch, Wellesley, '88), **John**

Lunny, Sid Banerjee, Tom Urban ('89), and David Blundin ('88). . . . And special mention to those who wrote to *Technology Review*. . . . **Bert Fritz**: "Greetings to all—I'm enjoying life in Karlsruhe, Germany, and have been for the past year and a half (on assignment with Exxon). Karlsruhe is located in southwestern Germany on the Rhine River, about an hour south of Heidelberg and less than 20 miles from the French border. In case anyone is in the area, stop by and visit—I expect to be here for a while longer. I'm hoping to extend my assignment through the end of '93!" . . . **Matthew Lewis** finished a master's in mechanical engineering at the University of New Mexico last term. He is now a staff member at Los Alamos National Laboratory and is enjoying Santa Fe with **Melissa Lewis** and their dogs, Marvin and Rasta.

Christine Hom graduated from New York University School of Medicine in June 1991. Congratulations! She is hoping to visit **Carol Webb Mohr** and her baby daughter, Margaret, this spring. Christine is enjoying the Young Alumni Activities in New York City and looking forward to seeing you all at the reunion. . . . Since September 1991, **Kyung Kim** has been attending Carnegie Mellon University Graduate School of Industrial Administration—the long name for their MBA program. Kyung is also looking forward to the reunion. . . . **Kenneth Fagin** is currently finishing up his last semester at Washington University School of Law in St. Louis. He will be starting work in August in Boston with Fish & Richardson, a law firm specializing in patent law and related fields of intellectual property.

And there have even been newspaper articles about your classmates, the latest appearing in the *San Diego Beach & Bay Press* about **Paul Sidhu**. Paul is an active National Guard Reservist, participating in the Guard's yearly war games, and a marketing manager for Paradise Galleries (PG), a company that sells porcelain dolls. . . . And I will have started a new job by the time you read this—at the City of New York Office of Management and Budget. I will be a senior analyst on the Homelessness Task Force.

Well, now you have heard it all! Take notes at the reunion so you, too, can be eligible for the grand prize!—**Stephanie Levin**, secretary, 159 W. 80th St., #1D, New York, NY 10024, (212) 595-3172, fax: (212) 983-9107

88

5th Reunion

I received a letter from **Steve Beaudoin** who writes of his escapades since MIT. (It's about time!) He received an MS in chemical engineering from the University of Texas at Austin in August 1990. He worked on an acid-rain abatement technology under the direction of Gary Rochelle (also an MIT alum). Steve is now at North Carolina State University, studying for a PhD in chemical engineering. He is really happy at NC State where he shares an office with **Elaine Habal**. In August of 1991 he became engaged to Diane Bauer, whom he met in Austin. They are planning a March 1993 wedding. I guess congratulations are in order!

Steve has also spoken with **Marybeth Wall**, **Mark Hanson**, and **Norm Chen**. They are all doing very well. Marybeth and Mark are working toward PhDs in chemical and aeronautical engineering, respectively. Norm is finishing his third year of medical school.

Glenn Hopkins has recently returned to Boston after a six-month stint in London pursuing leveraged buyouts for the Thomas H. Lee Co. . . . **Mary Lou Ravese** sends a postcard from the Olympics. She and eight other colleagues are skiing at Les Arcs, the site of the speed skiing competition. She transferred offices in November from New York to Sophia Antipolis in France, right on the French Riviera. She is living in an apartment in Nice, across from the beach. Life really sounds rough! . . . **Julie Levine** is graduating from medical school in May and will stay in Miami for her residency in pathology. She is also getting married in May to Gregg Friedman, a psychiatrist. They plan to honeymoon in British Columbia and

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Alberta. Congrats!

George Huang will be doing his general surgery residency at the University of Washington, Seattle. ... **Steve Stein** is doing a year of preliminary medicine at Columbia P&S, after which he will be a resident in anesthesia at the same medical center. I will be staying at NYU for my general surgery residency. I would love to hear from the rest of you as to where you are, where you are going, what you are up to. You get the picture. Note my new address. Ta ta for now.—**Grace Ma**, secretary, 19 Candlewood Rd., Lynnfield, MA 01940

89

There's not a lot of news to report this month, so please send some!

Kris (Sheahan) Maeda married John Maeda, '88, over a year ago, and they are now living in Japan. They recently had a baby daughter, Mika Joanne. John is working for the Japanese equivalent of the MIT Media Lab. ... **Harry Hochheiser** is still in the Boston area. Harry is currently working for the Tufts medical school on computer interfaces for disabled people. ... **Paul Tiao** is doing a joint JD and MS in public affairs at Columbia and Princeton. Paul will be in Lagos, Nigeria, working for the Nigerian Civil Liberties Organization over the summer. Paul is having a good time in NYC.

Dan Garcia is back at UC/Berkeley grad school after taking a semester off to be with his family. Dan met a great friend and fellow Macintosh hacker last summer, **Harry Baya**, '61. Dan just returned from a two-week vacation in Puerto Rico where he visited with **Roberto Sanchez** and **Kim Colon**. Roberto is studying for a JD from the University of Puerto Rico at Rio Piedras, and Kim is working as the chief of research to manufacturing supervisor for Searle, a pharmaceutical company. Also during Dan's first three days back at Berkeley, he saw the following grad students: **Deb Chen**; **Elisabeth "Libby" Schnieders**, '90; **Dan Mittleman**, '88; **Brian Dennis**; and **Sanjeev Arora**, '90.

Dan also recently passed his second (of four) preliminary exams. Dan still has a written software (6.035 + 6.033 stuff) and an oral graphics exam, but received a master's in CS this past semester. He just read an article about the lack of women in computer science by **Ellen Spertus**, '91, who is at MIT. Her paper has sent minor shock-waves through the UC/Berkeley Computer Science division, and almost everyone Dan has talked to "is being quite conscious of the way women in CS are related to." Dan reports that Berkeley started an undergraduate women's CS association almost the day after the report arrived.

Teri Centner writes that **Mark Moss** is now working for U.S. Spacecommand at Okinawa, Japan. He gets to go to Hawaii and Colorado pretty often. Teri also ran into **Rob Introne** in Teri's building at Wright-Patterson AFB, where Rob was visiting. ... **Sandy DeVincent** is still hard at work on a PhD at Case-Western, and **Cristina Vilella** is still at Castle AFB, and has a new roommate who went to the Air Force Academy. ... **Eric Tang** is working in the SF Bay area, and has been skiing at Squaw, Mt. Rose, and Heavenly. ... **Derek Chiou** is working in the Dataflow Group here at MIT, and recently passed his oral exams. And speaking of orals, I passed mine as well. So I guess I get to stick around here for a few more years. Please write of your summer adventures!—**Henry Houh**, secretary, 4 Ames St., Cambridge, MA 02142, (617) 225-6680, e-mail: tripleh@athena.mit.edu or henry_houh@mit.edu

90

Anne Law writes that she has been in Germany for almost two years! She lives in Hamburg and works as an international product manager in orthopedics for Beiersdorf. Most of us probably know Beiersdorf as the company that makes Nivea lotion. In December, Anne took a four-week vacation (Beiersdorf gives her 30 days of vacation per year!)

to the United States. She visited **Greg Gould** and **Feroze Dean** in New York City and when she got back to Germany, she saw **Nina Chen**, who is now learning German in Berlin. Anne is also trying to start an MIT Alumni Club in Germany. If anyone knows of an MIT alumnus living in Germany, please have him/her contact Anne at 040-20-5845 (home) or 040-569-4676 (work) or 040-569-6009 (fax).

Over the Christmas holiday season, **Kim McKanna**, a graduate student at Washington State University in the wildlife department, threw a holiday party. Among those attending were: **Angela Putney**, a graduate student in astronomy at CalTech; **Angela Rhoda**, who works in Boston; **Sandra Terauds**, who has just returned from working in New Zealand and Australia and is now finishing up an MIT degree; and **Lucien Van Elsen**.

After being married for over a year, **Arthur** and **Nikki (Skinner) Lent** write that they, along with their two kittens, **Tigger** and **Piglet**, are doing well in Somerville. Nikki is working on a master's degree at Tufts University. Her thesis involves solid waste incineration ash. Arthur received a master's degree from Course VI at MIT in January and, after passing his orals in February, he's well on his way to getting a PhD. Arthur and Nikki spent their winter break in Acapulco and on their flight back home, they saw **Maureen Kenneally** and **Don Euwart**, who were also vacationing in Mexico.

A couple of engagement announcements: **Meryl Alford** is engaged to **Eric Miller** and **Sandy Serkes** is engaged to **Aaron Goodisman**. Both couples are planning weddings for 1993. Sandy is working at Phoenix Technologies at University Park in Cambridge and Aaron is working at Caliper Corp. in Newton.

David Plasse has been consulting at JP Morgan, Systems Development Department, in New York City. He has also begun graduate school at New York University-Courant Institute for a master's in computer science. ... **Anne Louit** is working at the Genetics Institute. ... **Sima Setayeshgar** is a graduate student in physics at CalTech. ... **Rahul Sarpeshkar** is a graduate student in electrical engineering at CalTech. ... **Humphrey Chen** works for Price-Waterhouse in Glastonbury, Conn. However, he's currently on an 18-month assignment at Blue Cross Blue Shield of Illinois in Chicago. ... **Jonathan Katz** is a graduate student in political science at UC San Diego. ... **Tamal Islam** (formerly Mohammad) of Richland, Wash., suggests that anyone who wishes to work or study overseas should get *Transitions Abroad* magazine, which contains a lot of contact names. For more information, write to *Transitions Abroad*, Dept. TRA, Box 3000, Denville, NJ 07834. ... **John Hasemeyer** is interested in hearing from anyone who was a member of the 1986-1987 men's freshman heavyweight crew team. John's address is 1312 Rivard Dr., Bourbonnais, IL 60914.

On February 8, the MIT Alumni/ae Center of New York and CAMIT hosted a Chinese New Year's banquet to celebrate the Year of the Monkey. Over 60 alumni/ae attended the 10-course banquet at the elegant Triple Eight Palace restaurant in New York City's Chinatown. The evening's program included guest speaker MIT professor **Lucian W. Pye** and a performance by the Chinese Music Ensemble, the largest and oldest Chinese orchestra in the United States. Among those I spotted at the event were **Humphrey Chen**, **Kim Cheung** ('90 G), and **Kevin Lam**, '85.

How is everyone enjoying the summer? Please send news to me at nppeng@nycvmlc1.vnet.ibm.com or—**Ning Peng**, secretary, 355 South End Ave. #27G, New York, NY 10280, (212) 488-8486 (h) or (212) 745-2704 (w). Note that the internet address and work phone number will only be valid until 8/15/92.

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The frothy surf is lapping over a smooth, palm tree shaded beach on the postcard **Francisco Dóñez** sends from Costa Rica. The sky is blue and a few clouds hang gently in the Caribbean air. On the

other side of the card, **Francisco** writes that he is now the head English teacher at the Costa Rica High School of Science, which is a magnet school located in the capital city of San José. The Costa Rican government found Francisco through a program called WorldTeach that recruits North American college students to teach in countries that ask for assistance. If any other classmates are involved in teaching, either full-time, on weekends, or during the summer, please let us know.

I'm sure the sun is also shining over the ships of the Cunard Line where **Jon Rockman** works. He was the stage manager/cruise staff for over two months on the Cunard *Countess*. "Yes," he writes, "We're talking Love Boat here." He was also talking Tortola, Antigua, Martinique, and seven other Caribbean ports. In March, Jon joined the Cunard *Princess* to sail from Spain to the Canary Islands via several Mediterranean and Black Sea ports. Now he's moved on to the *QE2*, and says of the work, "Imagine working as much as you did at MIT but forcing yourself to smile all the time. You have to be nice to everybody. All the time."

Alex Min was commissioned as a 2nd lieutenant in the U.S. Marine Corps in September and graduated from The Basic School in Quantico, Va., in April. After being stationed in Boston for the spring, Alex is now in Pensacola, Fla., in flight school to become a marine corps aviator. Alex sends news about several classmates: **Dave Haldeman** is also in Pensacola, training to become a naval flight officer. **Jeff Cohen** is working for General Motors, and **Roger Knapp** and **Jeff Myjak** are in graduate school at MIT.

The board of the Asian American Arts Alliance recently appointed **Amy Wei-wen Chu** as its new executive director. Amy has a degree in architectural design from MIT as well as a degree in East Asian studies from Wellesley College. "With the Alliance," she says, "I am hoping to increase our services and level of advocacy, and really fulfill our role in serving the needs of the Asian American arts community."

To begin our spring break from BU Law, **Pete Stewart** and I drove to Jimmy Kunihiro's ('88) condominium in beautiful Bensalem, Pa. We were greeted by **Praveen Saxena** and **Paschal Stewart** and several other Phi Sig alumni. Praveen is now working for Elastomeric Technologies Inc. near Philadelphia. Paschal was on spring break from Bowman-Gray School of Medicine, preparing for March Madness to afflict several North Carolina college basketball teams.

I think **Dawn Mitzner** probably enjoyed the most memorable spring break: she travelled to Hawaii and became engaged to Paul LaPorte, '88. Dawn is in the Johns Hopkins School of Medicine and favors working "hands-on" with cadavers more than watching the less stimulating slide shows. ... **Sara Bottfeld** is working for Goldman Sachs. She probably thought she was on another routine business trip back to Boston recently. But **Paul Antico** found her just outside his office at Fidelity Investments and surprised her with his presence. They caught up on the latest news and it's rumored that they even talked about the Class Notes! Wow!

James P. Donohue is a graduate student in the Department of Chemistry at Harvard. ... **Michael Rizen** is performing biomedical research at the Massachusetts General and Brigham and Women's Hospitals in Boston. He plans to begin an MD/PhD program in the fall. ... I phoned **Sharra Davidson** who, as usual, had some good news about our classmates. She had just gotten off the phone with **Pat Gannon** who had called during a business trip to Cincinnati. Pat and **Alex Mayus** are sharing an apartment in New York. Pat works for Price Waterhouse and does a fair amount of travelling. ... **Yang Chen** is working for Prudential-Bache in New York and has gotten together with other Burton Third Bombers in New York, including **Ann-Marie Beals**.

You can help keep this column full by sending postcards; they're cheaper to mail and more fun to save. Have a great summer! Please write.—**Andrew Strehle**, secretary, 12 Commonwealth Court #10, Boston, MA 02135, (617) 232-2261

MILDRED DRESSELHAUS

A Career of Firsts and Onlys

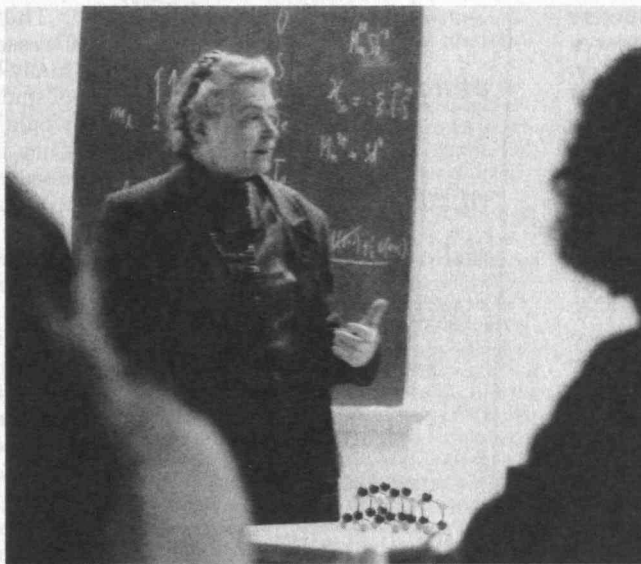
By Debra Cash

When Mildred Spiewak Dresselhaus was a young woman, no one ever used the term "role model." Yet since 1967 she has been just that to a wave of ambitious MIT women, as well as students of both genders who have followed her research interests in carbon science and solid state physics.

A woman celebrated for what Claude Brenner, '47, calls "all the firsts and onlys"—the first tenured woman on the MIT engineering faculty, the only woman to be named an MIT Institute Professor, the only woman to receive MIT's Killian Faculty Achievement Award, the first MIT woman to receive the National Medal of Science and to be named to the National Academy of Engineering, and recently the first woman to be elected to one of the four national offices of the National Academy of Sciences—Dresselhaus is a distinctive presence on campus. Crowned by a silver braid coiled, mittle-European-style, at the back of her head, she has a reputation for extraordinary powers of concentration that allow her to review complex technical papers or write cogent letters of recommendation while waiting for airplanes or the start of faculty meetings.

These days, one aspect of Dresselhaus' life's work has made its way to public consciousness and the popular press. Although she admits that she decided to concentrate on elucidating the properties of carbon, particularly graphite, when her four children were small "because it wasn't popular, and I wanted a topic that wasn't too competitive and was out of the way," she now finds herself in the vanguard of a burgeoning field. She has become one of the country's top researchers into carbon-60, or "buckyballs"—materials with a molecular structure reminiscent of Buckminster Fuller's geodesic domes, a form of carbon predicted as early as 1970, but only recently observed and identified.

Researchers suspected that buckyballs might be superconductors. What came as a complete surprise was the fact that there is a form of carbon-60 that superconducts at temperatures as high as 33 degrees



Kelvin. Dresselhaus herself is most interested in the potential of what she called buckyfibers—single layers of carbon with a structure resembling the interlocking hexagons of chicken wire—which she predicts will be both lighter and stronger than steel. Because of that lightness and strength and their ability to withstand high temperatures, buckyfibers could have an important role in aerospace applications.

These developments have attracted a lot of new blood into carbon-60 research—Dresselhaus estimates that 90 percent of today's researchers are newcomers. Her eyes gleam; it's clear she's delighted that a fresh group of scientists have recently started to share her enthusiasm.

Teaching More Than Equations

Conveying enthusiasm is something that Dresselhaus takes as an almost sacred trust. "Professors standing up in a lecture hall and repeating what is in a textbook may as well send the students to the library," she insists. "In solid state physics, an equation means 100 different things. You need an interactive format to explain that, and—if you're able—you have to teach more than the equation."

She is, she explains, trying to impart new habits of mind. "What we're teaching is current, but next year some new discovery might change the

emphasis, even the entire field. Students need to be able to ask the right questions and make that extension themselves."

Dresselhaus' own teaching style was greatly influenced by two seminal teachers. The first was Roslyn Yalow, whom Dresselhaus encountered when she entered New York's Hunter College in 1947, planning to become an elementary-school teacher. Yalow, a freshly minted PhD then unable to find a research or teaching assistantship as a nuclear physicist, was an under-graduate physics instructor. Yalow recognized Dresselhaus' gifts and encouraged her to go on in physics. "She's a very definite person," Dresselhaus says of

her mentor, who won a Nobel Prize in nuclear medicine 30 years later. "When she told me to pursue a scientific career, it wasn't so hard to agree."

Another important influence during her student years was physicist Enrico Fermi, with whom she studied while working toward her doctorate at the University of Chicago. "Fermi gave very clear lectures," she recalls. "He asked how we form the simplest model to explain [a set of] facts. After the lecture, every class was assigned one problem that was very deep and implied what you'd learned in new realms. I used to think after a lecture that I'd understood everything. Doing those problems, I'd always realize how much I didn't understand and all the gaps I had to fill in for myself."

In Chicago she met and married Gene Dresselhaus, a theoretical physicist who is now senior scientist at the Francis Bitter National Magnet Laboratory. He remembers that they began to collaborate soon after their marriage, writing a paper that interpreted the results of experiments she had conducted for her doctoral thesis. That personal/professional partnership continues to this day. "It's complementary," Gene Dresselhaus explains. "I specialize in theory, and she does the experimental work."

The couple went off to Cornell, but when her post-doctoral appointment there ended in 1960, no academic jobs were forthcoming. In one of those

unforeseen and ultimately productive swerves of fate, she spent the next seven years in a post at Lincoln Laboratory. Through experiments actually conducted at the Bitter Magnet Lab, she made significant contributions to understanding carbon's electronic structure and its behavior in high magnetic fields.

Mildred Dresselhaus officially came to the campus in 1967 as a visiting scholar on a fellowship named for Abby Rockefeller Mauze. "During those pre-Wiesner years, everything was very grey," remembers Aviva Brecher '68, for whom Dresselhaus was an early mentor. "Millie introduced color, putting culture next to science," says Brecher, now a senior scientist at the National Transportation Systems Center in Kendall Square. Dresselhaus used to schedule string quartet performances by an all-female ensemble as "overtures" to her electrical engineering seminar—playing the violin herself. She invited undergraduates, graduate students, coworkers, and staff to parties and musical soirées at her home.

"Don't Write Frantically—Listen."

Dresselhaus' devotion to teaching was apparent from her first few semesters, Brecher remembers, when she began the tradition of handing out written class notes, thus freeing her students to focus on listening. The Abby Rockefeller Mauze fellowship was made a tenured position, in part because her students circulated a petition begging the administration to keep her on.

Dresselhaus notes with some self-effacement that although she expected teaching solid-state physics to electrical engineering students would be a challenge, she was less prepared for what became an equally daunting role: an advocate for female faculty and students. It was a job, she shrugs, that "needed doing," and one that some of her critics wish that she had taken on with more revolutionary fervor. Yet Brecher points out that behind Dresselhaus' low-key method was a rare diligence—"quiet, steady change, pushing steadily in the same direction."

In 1967 the admissions process at MIT for women was far more stringent than that for men. Women were required to

**Beneficiary
of a rigorous education,
the mentoring
of two Nobel laureates,
and a supportive spouse,
Mildred Dresselhaus
is magnanimous
in dispensing
her own support
to those coming up
through the ranks.**

have higher test scores and were limited to four percent of the entering class, based on the number of rooms available in McCormack Hall. "Women's problems in those years were not about doing the work, but about taking the lumps and having the determination to continue," Dresselhaus recalls. "Some women were strong, but a surprising number were silent in classes. When they raised their hands, the professor wouldn't call on them or would put them down in such a way that they'd never ask another question. It was unintentional harassment: some of the professors couldn't put themselves in the shoes of women students to see how destructive it was. I started thinking we had to get together by departments in what we'd now call facilitation sessions."

Dresselhaus herself never bought the myths that women could not excel at math and science. A child of impoverished immigrants, she had earned a scholarship to Hunter High School in New York. MIT Philosophy Professor Judith Thompson, who was a year ahead of Dresselhaus at Hunter High, recalls that "they paid no attention to whether you were a woman or not. It was an all-girls school and it was very hard; it had standards you had to meet. You just did your work, and nobody said 'you poor little girls, we'll ease things off for you!'"

Thompson says that in 1972 Dresselhaus and Nutrition Professor Emily Wick, PhD '51, then assistant dean of students, announced a meeting of what would become the MIT Women's Forum. They invited women students, faculty, researchers, and staff. "I was so stunned to see all the women!" Thompson recalls. "In the ordinary course of a day in such a male-dominated institution, you'd see very few. The joy of those meetings was just immense. And Millie was marvelous: open and down-to-earth and sensible and strong-minded and vigorous and energetic."

Ever the scientist, Dresselhaus also heeded a suggestion from President Jerome Wiesner that the situation of women be reported as quantitatively as possible. "People at MIT understood comparisons and baselines," says Dresselhaus. "For example, at one point there was a series of articles in *The Tech* charging that women were being admitted with lower abilities. A delegation of undergraduate women came to me and said 'Do something!' We decided to study the allegations and let the chips fall where they may. If the guys were right, maybe a cutback was justified." The study, however, proved that the guys were wrong. As the percentage of women at MIT increased, their overall performance—measured in terms of cumulative grade point averages and how quickly each student fulfilled her graduation requirements—also went up.

The situation of women at MIT has changed, although Dresselhaus is the first to note that some feel it hasn't changed enough. When asked in 1990 whether she had any advice for incoming President Charles Vest, she highlighted an issue that still needs a lot of work. Women, especially those with young children, said Dresselhaus, are apt to have different career paths and different constraints than their male colleagues. She urged Vest to make an effort to accommodate that challenge.

Dresselhaus is as clear as ever on what "needs doing," and thanks in some measure to her groundbreaking example, there are a lot more women on campus to share the load. □

DEBRA CASH is a freelance writer based in Belmont, Mass.

I CIVIL ENGINEERING

Michael A. Collins, PhD '70, writes: "I became a senior project engineer with Woodward-Clyde Consultants in 1990. I was appointed water quality practice leader for the U.S. Gulf Coast in 1991."

... **Lawrence B. Wilson**, SM '77, has formed Wilson Consulting, a firm specializing in the application of information systems and electronic data



L.B. Wilson

interchange in the transportation industry. The new firm, based in Wilmette, Ill., is already at work on projects for several large transportation organizations. For the past 13 years Wilson was an executive with Santa Fe Railway, heading up internal information systems planning and customer EDI

implementation. ... **Theodore Von Rosenberg IV**, SM '80, reports: "Recently I co-wrote a paper entitled 'Densification of Loose Sands by Deep Blasting,' published by ASCE in the proceedings of a speciality conference on ground improvement. I'm currently serving as president of the Connecticut section of the American Society of Civil Engineers. I'm working for GZA GeoEnvironmental, Inc., as regional manager of the Connecticut offices, and I am also serving as a director on the board of the parent company—GZA GeoEnvironmental Technologies, Inc."

Michael S. Schultz, SM '81, an engineer specializing in environmental compliance for industry and in hazardous waste management, has joined Camp Dresser & McKee, Inc., in Cambridge, as a principal of the firm. Schultz will direct a variety of industrial compliance projects, including site investigations, remedial designs, corrective actions, treatment system designs, and permitting. Schultz has more than 15 years of experience in industrial environmental compliance, with particular expertise in geotechnical engineering and hazardous waste treatment. He has directed Superfund investigation and clean up programs throughout the EPA Region 1, and has provided remedial design and other compliance services to members of the aerospace manufacturing and pulp and paper industries, among others. ...

James M. Symons, SM '55, ScD '57, has written *Plain Talk About Drinking Water: Answers to 101 Important Questions About the Water You Drink* (The American Water Works Association, 1992). The book answers such questions as: Is my water safe? Where does drinking water come from? Is it necessary to buy bottled water? Are there

any health risks associated with fluoride?

Symons, director of the Environmental Engineering program at the University of Houston in Texas, has directed the drinking water treatment research program for the EPA.

Haley & Aldrich, Inc., has made two MIT promotions. **John P. Dugan, Jr.**, SM '68, manager of the Glastonbury, Conn., office, was named principal and senior VP of the firm. Dugan, a geotechnical engineer, has managed many major building and infrastructure projects during his 22 years with the firm. **Andrew F. McKown**, SM '78, of the firm's Rochester, N.Y., office, was named associate and VP. McKown, a geotechnical engineer, has been with the firm since 1978 and is a senior specialist in controlled blasting, construction vibrations, and tunneling. ... **John R. Williams**, who joined the MIT faculty in 1990, has been named to the Gilbert T. Winslow Career Development Chair in Civil Engineering. His area of specialty is at the intersection of noncontinuum mechanics of multi-body systems and computer support for design. Williams' research in the Intelligent Engineering Systems Lab involves the application of information systems to support the design process and

the development of computer tools for large-scale system design. ... Major General **Robert F. Seedlock**, SM '40, U.S.A. (Ret.), has been selected the recipient of Latin's Man of the Year Award for 1992 by the Cathedral Latin Alumni Association in Cleveland, Ohio.

Assistant Professor **David H. Bernstein** has been named to the Mitsui Chair in Civil Engineering. Bernstein specializes in transportation research. His current interests include congestion pricing (policies and technologies), network equilibrium models, and geographic information systems in transportation. Before joining MIT in 1990, he was research director at Atlantic Commodities, VP for software development at Investment Technologies, and project manager at the University of Pennsylvania's Network Analysis Lab. ... **Susan Murcott**, '90, SM '92, has published *The First Buddhist Women: Translations and Commentaries on the Therigatha* (Parallax Press). The book is described by the publisher as a contemporary translation of and commentary on the enlightenment verses of the first female disciples of Buddha: "The book explores Buddhism's relatively liberal attitude toward women since its founding nearly 2,600

Tyler Prize Shared by Two Alumni

The 1992 Tyler Prize for Environmental Achievement has been awarded to two MIT alumni. **Perry L. McCarty**, SM '57, PhD '59, and **Robert M. White**, SM '49, PhD '50, will share the \$150,000 prize.

McCarty, currently the Silas H. Palmer Professor of Civil Engineering at Stanford University, was cited for "being the world's leading environmental engineer working to protect the Earth's water resources. ... His innovative thinking on microbiological processes has led to novel approaches for water pollution control. He pioneered the use of scientific principles for anaerobic treatment that have led to its broad application, not only for municipal wastewaters, but for industrial and solid waste treatment as well." McCarty received a BS in civil engineering from Wayne State University and advanced degrees from MIT in sanitary engineering.

White, the first administrator of the National Oceanic and Atmospheric Administration from 1970-1977, was cited for "his leadership in designing and building the machinery through which society observes and understands global climate change. ... Through his inspired efforts, the U.S. Weather Bureau's warning system was modernized and the global atmospheric research program was planned and executed." After receiving an AB from Harvard in geology, White earned advanced degrees from MIT in meteorology.



Perry L. McCarty

The Tyler Prize, first presented in 1974 and funded annually by Alice C. Tyler, is administered by the University of Southern California. The prize is awarded for the protection, maintenance, improvement, or understanding of ecological and environmental conditions anywhere in the world, and for the discovery, further development, improvement, or understanding of known or new sources of energy. Nominations are solicited from around the world and may be associated with any field of science. McCarty and White were selected from more than 200 candidates. □



Robert M. White

years ago, through the study of the Therigatha, the earliest known collection of women's religious poetry." Murcott spent more than 10 years researching and translating the text of her book. She was a co-founder and editor of *Kahawai: Journal and Women of Zen*, and she teaches meditation at Wellesley College. Murcott is currently working on a portion of the final report, due in September, of the NRC's Committee on Waste Water Management in Coastal Urban Areas.

Humphreys T. Turner, CE '63, of Baton Rouge, La., died on July 17, 1989. He was a retired Louisiana State University professor of civil engineering, having taught for 35 years, and was a consulting engineer for Dawson Engineers. He was a veteran of World War II. Turner was a recipient of the Halliburton Outstanding Professor Award and the Civil Engineering Favorite Professor Award on several occasions. . . . **William Niessen**, SM '33, of Marco Island, Fla., died on October 10, 1991. He had been chief structural engineer at American Hoist & Derrick Co. for many years and had been in retirement for 20 years. . . . Brigadier General **Edward T. Podufaly**, SM '48, (Ret.) U.S.A., of Sherwood, Md., died on January 20, 1992. During his career with the U.S. Army, he had various engineering assignments from 1945-1968, including the design and construction of projects in Germany, France, Italy, Greece, Turkey, Canada, Greenland, the Azores, Japan, Korea, and Taiwan. He was commanding general of the U.S. Army Topographic Command, supervising productions of lunar maps and relief models of the moon's surface from lunar orbiter photography for Apollo manned moon expeditions. He retired from the Army in 1970. His military honors include, the Distinguished Service Medal, the Legion of Merit, and the Purple Heart.

II MECHANICAL ENGINEERING

Michael Dubey, SM '48, writes: "After 30 years in aerospace and defense development programs, I've hung my shingle up as an engineering management consultant. I've lectured on systems engineering management and concurrent engi-

neering in cities all over the world and conducted training courses for client companies in the U.S. and Europe. I'm most grateful to MIT for my initial 'kick-off' into a most rewarding career." . . . **John S. Berg**, SM '88, was married to Colleen Brown in Hawaii on January 14. . . . **Gerald A. Frederiksen**, SM '59, reports: "I recently retired from General Motors Corp. I'm now residing in Florida where I direct eight choirs in the United Methodist Church, with my friend/wife, who is the organist." . . . **Katherine B. Gasser**, SM '91, is working as a product design engineer at Texas Instruments in Attleboro, Mass. . . . **Bharat S. Bagepalli**, ScD '84, sends word: "I am at the corporate R&D Labs of GE in Schenectady, N.Y., in the Solid Mechanics Lab. I am involved in mechanical design, dynamics, tribology, micromachined devices, lightweight space structures, FEM, etc.—in short, 'everything'! I am married to a lovely Lithuanian from Vilnius, and we have a baby daughter." . . . **Carl C. Hiller**, SM '72, ME '74, PhD '76, writes: "My first child, daughter Anna Elizabeth Hiller, was born February 1, 1992! Mother and daughter are doing fine." . . . **Darrell A. Frohrib**, '52, SM '53, professor at the University of Minnesota at Minneapolis, and **Donald L. Margolis**, SM '69, ME '70, PhD '72, professor at the University of California at Davis, have been named Fellows of ASME.

Homer J. Wood, SM '40, consulting engineer at Power Dynetics, Inc., in Sherman Oaks, Calif., has been elected a Fellow of the SAE. He was cited for "pioneering mechanical design and engineering innovation in the fields of small aircraft gas turbines, cabin air compressors, air-cycle air conditioning systems, turbochargers, and vehicular diesel engine systems." . . . **Arthur E. Bergles**, '58, SM '58, PhD '62, the Clark-Crosson Professor and dean of engineering at Rensselaer Polytechnic Institute in Troy, N.Y., **Stanley Backer**, '41 (XV), SM '48, ScD '53, Course II professor emeritus and senior lecturer at MIT, and **Frederic F. Ehrlich**, '47, ME '50, ScD '51, staff engineer at GE Aircraft Engines Co., in Lynn, Mass., have been elected members of the National Academy of Engineering. Bergles for "seminal contributions and outstanding service and leadership in the field of heat transfer," Backer for "enhancing the understanding and engineering of fibrous materials to improve their performance in ocean and other engineering applications;" and Ehrlich for "contributions to the design and development of aircraft gas turbine engines and the technology of rotor dynamics." . . .

Mary C. Boyce, SM '84, PhD '87, and **Anuradha M. Annaswamy**, Course II assistant professors, are recipients of NSF Presidential Young Investigator Awards. The awards finance research by faculty members near the beginning of their careers. Boyce's field of study is the mechanics of materials and manufacturing; Annaswamy's is non-linear control and adaptive control. . . . Course II Assistant Professor **Simone Hochgreb**, has been appointed to a two-year term as the Lynde and Harry Bradley Foundation Career Development Professor. The Bradley Foundation chair supports young fac-

ulty interested in research areas where start-up costs are high. Hochgreb's experimental capabilities in instrumentation, experimental design, and data interpretation were cited in the announcement of her appointment. Hochgreb, who joined the MIT faculty last year, conducts research in the Reacting Gas Dynamics Lab and the Sloan Automotive Lab.

Kenneth R. Fox, SM '40, of Rockport, Mass., died on February 22, 1992. Fox taught at MIT from 1940-45. In 1945, at the age of 29, Fox became president of Lowell Textile Institute, the youngest college president in the country at the time. While still teaching at MIT in 1942, he and two other MIT graduates established Fabric Research Laboratories, Inc., in Boston. He was a director of the lab from 1942-72, vice chair from 1967-70, and chair until 1972, when the company was absorbed by Albany International Corp. Fox remained as VP for research until he retired in 1978.

III MATERIALS SCIENCE AND ENGINEERING

From Nigeria, **Okwuchukwu M. Nduaguba**, SM '78, writes: "I returned to my country in 1979 and secured a job with Delta Steel Aladja-Worri in 1980. Worked as a production manager in pellet-making plant till June 1982. I then took a job as a project engineer with Adtec Ltd Lagos. Worked on feasibility, production, and sale of medium-voltage electrical switchgears. I was co-founder of Adswitch Plc—a switchgear manufacturing outfit of Adtec Ltd. Currently I am general manager and a shareholder." . . . From Hong Kong, **Winston W. Liang**, ScD '76, sends word: "I have recently been appointed chief executive of the Hong Kong Industrial Technology Centre, a government-owned statutory company focused on upgrading Hong Kong's technology base. Formerly, I set up the Office of Industrial and Business Development at the Chinese University of Hong Kong, which I joined in 1989 from Amercom. HKITC is a high-tech start-up incubator, a technology transfer agent, and a conduit for venture capital and has great potential in the area of changing Hong Kong's technology focus." . . . **Peter R. Bridenbaugh**, PhD '68, executive VP for science, technology, engineering, environment, health, and safety at Aluminum Co. of America in Alcoa Center Pa., has been elected a Fellow of the NAE. He was cited for "contributions to the development, manufacturing, and commercialization of advanced materials."

Thomas W. Eagar, '72, ScD '75, the Richard P. Simmons Professor of Metallurgy and the Leaders for Manufacturing Professor of Materials Engineering, presented the Comfort A. Adams Lecture at the opening of the American Welding Society's annual convention held last March. The Adams lectureship, the highest scientific honor given by the society, was established in 1943 to honor its founder and first president, Comfort Adams, who was the first dean of engineering at Harvard University and also a faculty member at MIT. At the same convention, Eagar, with a former student, **Y.S. Kim**, PhD '89, and a collaborator from Idaho National Engineering Lab, Donald McEligot, received the Charles H. Jennings Memorial Award. The award, which honors a former president of the AWS, is given for the most valuable welding research paper published in the *Welding Journal* in the prior year. This is the second time Eagar has received the Jennings Award; the first was in 1984. . . . Course III Assistant Professor **David C. Dunand**, PhD '91, has been named the first holder of the AMAX Career Development Professorship in Materials Engineering. AMAX, a leading U.S. producer of aluminum and other metals, established the professorship through its charitable foundation. The chair will support junior faculty members with strong interests in the science and industrial application of advanced



A mechanical engineer who goes from being governor of New Hampshire to White House chief of staff to co-host of CNN's Crossfire? Now that's a career path! John Sununu, '61, SM '63, PhD '66, is in the news again. Only this time, he is commenting on it. Sununu

started appearing on the nightly show in early March, temporarily filling in while Patrick Buchanan is on the presidential campaign trail. Sununu takes the conservative tack on events, while co-host Michael Kinsley, the New Republic columnist, is cast as the liberal.

materials. Appointments will be made for three-year terms. Since 1986, Dunand has worked with **Andreas Mortensen**, PhD '86—first as a research assistant, then as a postdoctoral fellow on the micromechanics of thermal mismatch in metal matrix composites. His current interests are in the area of high-strength, high-temperature materials, such as titanium alloys, nitrogen steels, inter-metallics and metal matrix composites. . . . **Peter K. Domalavage**, ScD '80, has been named senior



P.K. Domalavage

VP for operations at UltraFine Powder Technology, Inc. In this newly created position, Domalavage will be responsible for all operations including purchasing, manufacturing, and secondary finishing, as well as shipping and receiving. He joined UFP in 1988 as director of manufacturing and developed the firm's proprietary process.

During 1990, he was responsible for the design, construction, and start-up of the company's new production facility in Woonsocket, R.I.

Malcolm C. McQuarrie, ScD '52, of Oakland, Calif., died on January 3, 1992, of complications resulting from AIDS. He spent most of his working years as a patent attorney for Kaiser Aluminum. McQuarrie, an arts supporter, was a member of the ACLU, Pacific Friends, and Mensa.

. . . **Robert L. Kamm**, ScD '47, of Birmingham, Mich., died on January 27, 1992, of a cardiac arrest. Kamm held a wide variety of jobs combining the scientific and medical professions during his career. He worked with a group at Princeton researching atomic physics, which later became the Manhattan Project. After earning a doctorate at MIT in metallurgy for advances in powdered metal technology, he taught at the University of Melbourne in Australia, keeping an interest in industrial applications. He then returned to Detroit and took a position at Carbonyl Corp. working on permanent magnet technology. Kamm's interest began to shift to medicine and he received an MD from Western Reserve School of Medicine. While there he also developed photographic and video techniques for ophthalmology which are in general use today. Specializing in psychiatry, he practiced psychanalysis and psychiatry in Birmingham and served as staff physician and in other positions at numerous local hospitals and clinics.

IV ARCHITECTURE

Todd L. Siler, SM '81, PhD '86, writes: "I recently completed a portfolio of 37 prints, titled *Metaphorming Minds*, which was published by Old Jaffa Press in Israel. The portfolio was produced in part during the Gulf War and was created in response to the war. One other note: the paperback edition of my book *Breaking the Mind Barrier* (Touchstone Books, 1992) has recently been issued." . . . **John Blackwell**, MCP '47, who has retired from Boston Natural Areas Fund, Inc., writes: "The Arnold Arboretum Park Endowment, Inc., and A Tree Care Fund for the Boston Common & Garden are keeping me happily busy, raising money, making new acquaintances, and renewing many older ones. How can 45 years have passed since I graduated from MIT?" . . .

Wael J. Abu-Adas, MAR '91, sends word: "I am presently working in Winter Haven, Fla., for Todd Bryant Rose & Associates. I am doing large residential homes, studying for the A.R.E. and rollerblading in my spare time. I love the work and the weather, but miss Boston's social and cul-

tural life." . . . **Everett A. Glendening**, MAR '54, reports: "I was one of 12 architects on an architectural delegation to China last year to help them on 'high rise construction.' Total of 17 days including a week in Beijing, 4 days in Wuhan, 3 in Xamain, and 3 in Hong Kong."

Julie A. Moir Messervy, MAR '78, a garden design consultant at Messervy Associates in Wellesley, Mass., has written *Contemplative Gardens* (Howell Press, 1990). She is also a contributing editor to *Connoisseur* magazine. . . . From New Orleans, **Gerald W. Billes**, MAR '72, reports: "My office has recently completed the second phase of the New Orleans Convention Center, a \$95-million project along the riverfront corridor. Studies have been prepared for a third phase which will be by our office as well. A new police station and a new and renovated Concourse "C" are currently being completed as well. We feel that Billes/Manning Architects is one of the best general practices in our region." . . . **Marian S. Moffett**, MAA '73, PhD '75, sends word: "I will spend six months (January through June 1993) in Kraków, studying traditional wooden architecture of the Polish Carpathian Mountain districts. Right now, learning Polish is proving a real challenge." . . . **Peck Yee Tan**, MAR '91, is now located in Hong Kong. . . . **John R. Frazier**, MAR '63, was recently promoted to chief architect with Anderson-Nichols and Co., Inc. In his new position, Frazier will oversee the management and administration of the architectural department at the Boston-based architectural, engineering, and environmental consulting firm.

MIT will receive a \$1.25 million endowment over the next five years from the Toda Corp. of Japan, one of Japan's top general contractors. The first installment of \$250,000 will be used for research at the discretion of MIT; the rest will be invested as an interest-producing endowment. The funds will create opportunities for international contact between the people of MIT and Toda through joint research and mutual visits. According to **Michael Joroff**, director of R&D in the School of Architecture, an initial allocation of some of the Toda funds will go to the MIT Program in Innovative Housing Construction, a major research program aimed at improving the performance and production of housing. Income from the endowment may further be used to create Toda Fellowships for graduate students and/or faculty members every year who are interested in pursuing research in this area. Some of the funds may also be used for a central research facility to house MIT's Building Technology Program, a program closely aligned with Toda's interests in the field and designed to develop a new breed of professional known as the building technologist. The building technologist will not actually design or build buildings, but will instead develop new techniques and materials for those tasks, as well as for the proper operation of the building. The Toda Corp., established in 1881, has been involved in many overseas projects, beginning with the construction of a pavilion for the Anglo-Japanese Fair held in London in 1910.

William M. Hunt, MAR '47, of Lambertville, N.J., died on January 15, 1992. Before WWII, he joined architect Antonin Raymond as an associate in New York City and New Hope, Pa. There he did war work, including much of the design of Camp Kilmer. In 1942, he was drafted and rose to the rank of second lieutenant in the 1st Battalion Aviation Engineers, designing airfields in England, France, and Germany. After the war, he obtained a degree from MIT, and established a practice. Over a 40-year period, he designed many homes. He also designed several major buildings for the Wardlaw School of Plainfield, N.J., and for Solebury School in New Hope, Pa. He helped establish the Phillips-Barber Health Center in Lambertville. . . . **Elizabeth G. Pattee**, '16, of Hightstown, N.J., died in March 1991. She was an architect who taught at the Lathrop School of

Architecture in Groton, Mass., until 1944. She was then at the Rhode Island School of Design from 1945-62, where she was an associate professor and headed the Department of Landscape Architecture. Pattee practiced architecture in Boston from 1924-44, then in Rhode Island until her retirement in 1963. She was a fellow of the American Society of Landscape Architects and a member of the American Institute of Architecture. . . . The Association of Alumni and Alumnae has been notified that **James P. Storm**, MAR '47, of Menlo Park, California, died in 1991. There was no further information provided.

V CHEMISTRY

William R. Moser, PhD '64, professor of chemical engineering at Worcester Polytechnic Institute, was elected to serve as chair-elect of the Petroleum Chemistry Division of the American Chemical Society. . . . **Jeffery S. Carter**, PhD '86, writes: "I am a research specialist at Monsanto Corporate Research in the Pharmaceutical Science Group in St. Louis, Mo." . . . **Tung Po Lin**, PhD '58, reports: "After retirement in July 1991, I am still very active in part-time teaching and in a cultural exchange program with China." . . . **John E. Sheats**, PhD '66, sends word: "I will be directing ACS Project SEED and Research Corp. Partners in Science Programs at Rider College in Lawrenceville, N.J., during the summer of 1992. I am currently a professor of chemistry at Rider." . . . **C. Scott Blackwell**, PhD '71, writes: "I was



C.S. Blackwell

appointed a Union Carbide Corporate Research Fellow in January 1991. This rank (including senior fellow) is the high technical rank in the corporation. The appointment recognized major scientific accomplishments in support of UCC businesses in molecular spectroscopy covering infrared, Raman, and particularly multi-nuclear solid-state NMR. I head the NMR Skill Center of Union Carbide's Central Scientific Lab in Tarrytown, N.Y. I was married in late 1990 to the former Kathryn Parker, and we reside in Ossining, N.Y." . . . **Elwood P. Blanchard, Jr.**, PhD '59, retired as vice chair at E.I. du Pont Nemours & Co. in Wilmington, Del., on March 31. **Ned M. Winsenker**, PhD '69, has been named chair of the board at Iomed, Inc., a Salt Lake City-based drug delivery systems company. He had been president of Churchill Oaks Consulting in Palo Alto, Calif. . . . The following alumni have been elected to membership in the National Academy of Engineering: **Frederick J. Karol**, PhD '62, senior corporate fellow at Union Carbide Corp. in Bound Brook, N.J., for "leadership in invention of olefin polymerization catalysts and development of a fluidized bed olefin polymerization process"; **Alexander MacLachlan**, PhD '57, senior VP for R&D at E.I. du Pont de Nemours & Co. in Wilmington, Del., for "leadership in chemical research, development, and engineering"; and **Maxine L. Savitz**, PhD '61, director of Garrett Ceramic Components at Allied-Signal Aerospace Co. in Torrance, Calif., for "technical developments contributing to national initiatives in energy conservation and energy efficiency." . . . **John S. Waugh**, ScD '60, MIT Institute Professor and recognized authority on magnetic resonance, was presented with the 1992 Theodore William Richards Medal for "conspicuous achievement in chemistry" by the Northeastern Section of the American Chemical Society. After his presenta-

tion, Waugh gave a lecture entitled, "NMR: An Alchemist's View." Presented once every two years, the medal honors outstanding achievement in the field of physical chemistry.

Daniel S. Kemp, Course V professor, has been named a MacVicar Faculty Fellow. He is one of six professors recognized for their "exemplary and sustained contributions" to undergraduate education under a new program named for the late Margaret L.A. MacVicar, '64 (VIII), ScD '67 (III), the first dean of undergraduate education. Faculty members are appointed for 10-year terms and receive \$5,000 each year in discretionary funds for support of educational activities, research, travel, and other scholarly expenses. Exxon Educational Foundation has given a \$1-million gift and MIT has committed \$10 million in endowment to the program. "My freshman organic class with Professor Kemp was the best course in my undergraduate career. When I talked with friends from other colleges, even those majoring in chemistry, and told them how much I enjoyed my organic class, most of them were shocked. At other schools, it seems, organic is one of the most disliked classes in the whole undergraduate curriculum" was a comment submitted to the provost about Kemp. . . . **Moungi G. Bawendi**, Course V assistant professor, has been named by the NAF to receive a Presidential Young Investigator Award. The award, which finances research by faculty members near the beginning of their careers, helps colleges and universities attract outstanding young PhDs who might otherwise pursue non-teaching careers. Each recipient receives up to \$100,000 a year for five years in a combination of federal and matching private funds.

Gerald L. Simard, PhD '37, of Winterport, Me., died on January 30, 1992. He spent 20 years doing research at Battelle Institute; American Cyanamid, and Schlumberger Research before joining the chemical engineering staff at the University of Maine at Orono. Simard was a charter member of the Electron Microscopy Society of America. . . . The Association of Alumni and Alumnae has been notified that **William H. Reeder III**, PhD '76, of Warren, N.J., died in 1991. There was no further information provided.

VI ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

Klaus Bartels, SM '75, writes: "I am presently assigned to NATO's Supreme Headquarters Allied Powers Europe near Mons, Belgium, as chief of the ADP Projects Section." . . . **Irwin L. Newberg**, SM '59, reports: "I am working on IR&D on microwave applications of fiber optics at Hughes Aircraft Co. in the Radar Systems Group." . . . **Robert M. Metcalfe**, '69, inventor of the widely used Ethernet networking technology and founder of 3Com Corp., has been appointed publisher and CEO of InfoWorld Publishing Corp., publishers of *InfoWorld*, a leading newsweekly for corporate PC managers. . . . **J.L.**



J.L. Flanagan

to speech technology." According to an award news release, "Flanagan has made outstanding contributions in the areas of speech analysis,

Flanagan, SM '50, ScD '55, director of the Center for Computer Aids for Industrial Productivity at Rutgers University and the Board of Governors Professor in Electrical and Computer Engineering there, has been named the 18th recipient of the Marconi International Fellowship Award. Flanagan was cited for "his pioneering contributions

speech transmission, and acoustics. His work includes modeling of basilar membrane motion, which has led to engineering models of auditory signal processing. His achievements with mathematical and experimental modeling of vocal excitation for speech production have provided a basis for advanced speech synthesizers. Flanagan's research also includes theoretical and practical aspects of formant and phase vocoders and perceptual experiments on the fundamental capability and limits of human hearing, including the characterization of binaural lateralization. His theoretical contributions have been essential preconditions for the rapid development of products for speech encoding, automatic speech recogni-

John Clark Sheehan

1915-1992

Professor Emeritus John C. Sheehan, whose chemical synthesis of penicillin at MIT in 1957 led to the development of many tailor-made forms of the drug, died March 21 of congestive heart failure at his home in Key Biscayne, Fla. He was 76 years old.

The synthesis of penicillin solved one of the most baffling problems of modern chemistry. Discovered in 1928 by Scottish bacteriologist Alexander Fleming, penicillin was desperately needed during World War II. Using the natural mold process, it took months to produce the drug and the yields were low. During the war, about 1,000 scientists in 39 laboratories in the United States and Great Britain spent about \$20 million in a frantic but unsuccessful attempt to synthesize penicillin. After that effort failed, many organic chemists concluded it was impossible.

Sheehan, who joined the MIT faculty in 1946, embarked on a nine-year effort to synthesize penicillin in 1948. He described the penicillin molecule as unstable. It disintegrates easily, and constructing it in the laboratory, he said, was like "placing an anvil on top of a house of cards."

One of Sheehan's closest MIT colleagues, George H. Buchi, professor of chemistry emeritus, said that the first total synthesis of a penicillin was made possible by "John Sheehan's brilliant planning and the meticulously high quality of his work." Although it "remains Sheehan's most significant scientific achievement," he added, it was only one element in

an "astonishing career."

In achieving total synthesis, Sheehan also produced an intermediate

compound in the form of a basic penicillin nucleus. By stringing various chemicals into the nucleus, he was able to produce new types of penicillin to combat particular bacteria. Among his inventions was Ampicillin, a commonly used semi-synthetic penicillin taken orally rather than by injection. Other researchers built on this

work to turn out hundreds of kinds of synthetic penicillin.

A native of Michigan, Sheehan graduated from Battle Creek College in 1937 and received a master's and PhD in organic chemistry from the University of Michigan. In 1941, he co-developed with the late Professor W.E. Bachmann of the University of Michigan a large-scale method for manufacturing the militarily important high explosive RDX, or cyclonite. He was a senior research chemist at Merck & Co. in Rahway, N.J., before coming to MIT.

Sheehan also did research in amino acids, peptides, alkaloids, and steroids. In 1982, MIT Press published his book, *The Enchanted Ring: The Untold Story of Penicillin*. He was the author of more than 150 scientific publications.

Sheehan was a scientific adviser to Presidents John Kennedy and Lyndon Johnson from 1961 through 1965, serving on a number of presidential advisory committees. He became professor of organic chemistry emeritus and senior lecturer in 1977. □



tion, speech synthesis, and the digital hardware that supports speech processing. Flanagan's work has provided the basis for many of the low-bit-rate coding algorithms now in wide use for telecommunications and electronic voice mail systems. He has done pioneering work on acoustic signal processing, and his efforts have led to the development of autodirective microphone arrays for teleconferencing."

David A. Garbin, '67, SM '73, EE '73, principal engineer at Mitre, was presented with the General Manager's Award for Excellence from the Center for Civil Systems. He received a plaque that recognizes him for "the development and implementation of the Extended Publicly Available Price

Index Concept for FTS2000 Switched Voice and Dedicated Transmission Services." Garbin's concept measures the price performance of AT&T and US Sprint, the two FTS2000 vendors. Using a "market basket" of telecommunications services, his program compares FTS2000 prices to an index of prices for publicly available telecommunications services, computed every six months. As the public index moves down, there is a corresponding downward movement in FTS2000 prices. \$50 million is expected to be saved by the government as a result of the new system's implementation. . . . The National Academy of Engineering has elected the following alumni to membership: **Joseph F. Keithley**, '38, SM '38, founder and former chair of Keithley Instruments, Inc., in Cleveland, Ohio, for "pioneering contributions to electronic test and measurement instrumentation"; **Stewart D. Personick**, SM '68, EE '69, ScD '70, assistant VP of the Information Networking Research Lab at Bell Communications Research, Inc., in Morristown, N.J., for "contributions toward fostering the theoretical understanding and practical applications of optical and electro-optical sensors"; **Charles L. Seitz**, '65, SM '67, PhD '71, professor of computer science at California Institute of Technology for "pioneering contributions to the design of asynchronous and concurrent computer systems"; and **Raymond S. Stata**, '57, SM '58, chair, president, and CEO at Analog Devices, Inc., in Norwood, Mass., for "leadership in the development of electronic device technology."

Dimitris J. Bertsimas, SM '87, PhD '88, Course VI professor, is a recipient of an NSF Presidential Young Investigator Award. The award finances research by faculty members near the beginning of their careers. Bertsimas' field of study is operations research. . . . Course VI faculty members **Anant Agarwal**, assistant professor; **Munther A. Dahleh**, associate professor; **Jesus A. del Alamo**, ITT Career Development Associate Professor (all in electrical engineering & computer science); **Martha L. Gray**, SM '81, PhD '86, the J. W. Kieckhefer Assistant Professor of Electrical Engineering (in bioengineering of connective tissues); and **Martin A. Schmidt**, PhD '88, the Carl R. Soderberg Assistant Professor in Power Engineering (in microfabrication technology); have been named by the National Science Foundation to receive Presidential Young Investigator Awards. The awards, which finance research by faculty members near the beginning of their careers, help colleges and universities attract outstanding young PhDs who might otherwise pursue non-teaching careers. Each recipient receives up to \$100,000 per year for five years in a combination of federal and matching private funds. . . . **Harold Abelson**, PhD '73 (XVIII), Course VI professor, has been named



H. Abelson

a MacVicar Faculty Fellow. He is one of six professors recognized for their "exemplary and sustained contributions" to undergraduate education under a new program named for the late Margaret L.A. MacVicar, '64 (VIII), ScD '67 (III), the first dean of undergraduate education. Faculty members are appointed for 10-year terms and receive \$5,000 each year in discretionary funds for support of educational activities, research, travel, and other scholarly expenses. Exxon Educational Foundation has given a \$1-million gift and MIT has committed \$10 million in endowment to the program. "His course, now widely emulated in this country and elsewhere, has introduced several generations of computer scientists to a way of thinking that is a far cry from the usual pedagogy" . . . "The universal feedback is always that he

is a patient mentor, inspired teacher, and insightful scientist" were comments submitted to the provost about Abelson

Shafira Goldwasser, Course VI associate professor, has also been recognized by the NSF. She is one of 100 outstanding female professors in science, mathematics, and engineering to receive Faculty Awards for Women. The awards, totaling \$5 million, are intended to recognize the accomplishments of women in research and teaching and to provide them with funding to facilitate their further development as leaders. Each award consists of \$50,000 per year for five years to support the awardee's research activities. Goldwasser's field is computers and computer theory.

David H. Bernstein, '73, has been named to the Mitsui Chair in civil engineering at MIT. Bernstein specializes in transportation research. His current interests include congestion pricing (policies and technologies), network equilibrium models, and geographic information systems in transportation.

MIT Professor **Qing Hu** has been named the KDD Career Development Professor in Communications and Technology. His research efforts focus on the study of response of solid-state devices to high-frequency radiation and the development of high-frequency (>100GHz) and high-speed (<10 picosecond) electronic and optoelectronic devices. Conventional semiconductor devices, such as diodes and transistors, fail to function at this frequency range because of the limitations of mobility and feature size. New approaches and novel device concepts must be developed. Hu is currently working on the development of superconducting electronic devices, semiconductor quantum-effect devices, and solid-state far-infrared (THz) lasers. The results of his research may greatly benefit space-to-ground communications and high-frequency and high-speed signal processing. . . . Also at MIT, **Leslie A. Kolodziejski** has been named to the Karl Van Tassel Chair in electrical engineering and computer science. Her principal fields of interest are solid state physics, electronic materials, and optoelectronics. Kolodziejski is a member of the Materials and Fabrication section of the Research Laboratory of Electronics where she has led experiments in the fabrication of novel semiconductors using advanced epitaxial growth techniques.

Richard H. Fuller, SM '54, of Clearwater, Fla., died on October 2, 1991. He was the assistant chair of and an instructor in the Department of Industrial Engineering at the University of Central Florida in Orlando. . . . Colonel **Thomas K. Hughes**, SM '47, of Dickinson, Tex., died on April 10, 1991. There was no further information provided.

VI-A INTERNSHIP PROGRAM

VI-A's 75th Anniversary Celebration will have gone down in history when you read this article, which has a March deadline. Right now we are encouraged by the many who have expressed an interest in the celebration activities!



J.F. Reintjes

ment by directing our new "Masters in Industry" program and teaching a recitation section of 6.071,

On another note of historical interest, the EECS Department held a reception in the Grier Room, on February 19, honoring **J. Francis Reintjes** on his 80th birthday. Many of you will remember him as VI-A Director from 1960-69, my immediate predecessor. Frank is now emeritus professor of electrical engineering and continues to be active in the Department by directing our new "Masters in Industry" program and teaching a recitation section of 6.071,

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"Introduction to Electronics."

VI-A's seen at Frank's party included: **Donald R. Knudson**, '54, SM '55, **James O. McDonough**, '43, SM '47, **William M. Pease**, '42, SM '43, **FredERIC R. Morgenthaler**, '55, SM '56, PhD '60, and **Markus Zahn**, '67, SM '68, EE '69, ScD '70.

On the first Monday, Tuesday, and Wednesday of March, the representatives of our 22 VI-A participating companies came to the campus for the annual VI-A business meeting, company open house, and interviews. Two hundred and one students filed applications for this year's 83 available positions (183 sophomores and 18 juniors), representing 55.5 percent of the Course VI sophomore class of 330. Final decisions will be made in early April. These figures certainly indicate that VI-A is alive and well under the directorship of **Kevin O'Toole**, SM '57, NE '57 (XIII).

With the chance of an omission, the following VI-Aers represented their companies as interviewers: **Michael P. Chin**, '86, SM '87, AT&T Bell Labs; **Dean R. Collins**, '58, SM '59, Texas Instruments; **Chester M. Day, Jr.**, '57, SM '58, Bellcore; **Charles B. Dieterich**, '77, SM '78, Sarnoff Research Center; **Andrew J. Eisenberg**, '79, SM '82, DEC; **Jenny M. Ford**, '81, SM '82, Motorola/Phoenix; **Neil M. Haller**, '58, SM '59, EE '61, Bellcore; **Gary K. Montress**, '69, SM '71, EE '71, PhD '77, Raytheon Co.; **Steven L. Rohall**, '87, SM '88, Bellcore; **Nancy (Saraf) Stevens**, '81, SM '82, AT&T Bell Labs; **Raymond L. Veith**, '90, SM '90, Tektronix; and **Craig L. Zarmer**, '83, SM '84, Hewlett-Packard.

In the honors and awards category, **Stuart E. Madnick**, '66, SM '69, EE, '71, PhD '72, the John Norris Maguire Professor of Information Technology and Leaders for Manufacturing Professor, accepted the Enterprise Network Excellence Scholarship Award on behalf of the Sloan School of Management. The \$7,500 unrestricted grant recognizes achievement in enterprise networking that enhances profitability and efficiency and oth-

erwise solves practical business problems; the funds providing financial support for graduate study of the effect of information technology on management issues.

A conversation with **Edward W. Maby**, '73, SM '75, PhD '79, on the electrical engineering faculty at Rensselaer Polytechnic Institute, confirms that RPI plans to start a new co-op program this summer. Ed has been the proposer of this and has consulted with me about procedures, contracts, etc., as applied by the VI-A Internship Program. Their program will probably select students at the end of their junior year to serve on a probational summer industrial assignment which, if completed satisfactorily and coupled with satisfactory academic performance in the senior year, will lead to fully supported graduate assignments. Many of you "old timers" will recall the Mu Rho Chi organization through which MIT, Rensselaer, and Cornell co-op students acted jointly to coordinate housing arrangements, etc., where assignments overlapped at participating companies.

Two announcements on VI-Aers in the IEEE's March/April 1992 *The Institute*: **Jack S. Fuhrer**, '66, SM '67, EE '71, is to be director of the Advanced Television & Systems Laboratory under the R&D Division of Hitachi America in Princeton, N.J., and **Richard S. Withers**, '75, SM '76, ScD '78, is to head the analog system development area that encompasses the use of superconductor films for microwave technology at Conductus, Inc., in Sunnyvale, Calif.

And finally, our list of VI-A alumni/ae visitations and contacts since last writing. **Paul M. Anderson**, '91, SM '91, was on campus giving a presentation on behalf of Motorola of Austin, Tex. ... **Ho John Lee**, '85, SM '85, came by to chat with me, his former advisor ... I had a chance meeting in the corridor with **Daniel M. Sable**, '80, who informed me that he has completed his doctoral work at VPI. ... **Pierre R. Yanney**, '88, SM '88, who was visiting **Robert H. Kingston**, '47, SM '48, PhD '51 (VIII), tells us he is now attending Rutgers Law School and expects to finish in June 1993.—**John Tucker**, director (emeritus), VI-A Internship Program, MIT, Rm. 38-473, Cambridge, MA 02139.

VII BIOLOGY

Gwen Grabowski Krivi, PhD '78, a senior fellow with the Monsanto Co. in St. Louis, Mo., has been selected as one of three recipients of the second annual Needham High School Distinguished Career Award. Krivi is the first woman chosen to receive the award and the first person to be chosen for work in a highly technical scientific field. ... **Graham C. Walker**, Course VII professor, has been named a MacVicar Faculty Fellow. He is one



G.C. Walker

of six professors recognized for their "exemplary and sustained contributions" to undergraduate education under a new program named for the late Margaret L.A. MacVicar, '64 (VIII), ScD '67 (III), the first dean of undergraduate education. Faculty members are appointed for 10-year terms and receive \$5,000 each year in discretionary funds for support of educational activities, research, travel, and other scholarly expenses. Exxon Educational Foundation has given a \$1-million gift and MIT has committed \$10 million in endowment to the program. "There are precious few professors who are as genuinely concerned about the experience undergraduates receive at

MIT to the degree that Professor Walker is" ... "He is an exceptional teacher with the rare ability to help students comprehend theoretical concepts and to apply this learning in laboratory situations" were comments submitted to the provost about Walker. ... **Robert A. Weinberg**, '64, PhD '69, a member of the Whitehead Institute for Biomedical Research and Course VII professor, is among 10 U.S. scientists selected to receive the Christopher Columbus Discovery Award in Biomedical Research. Weinberg was selected for "pioneering studies leading to the identification of a gene capable of converting normal cells into cancerous cells, thereby laying the groundwork for understanding cancer as a genetic disease." The one-time awards are cosponsored by the Christopher Columbus Medical Sciences Committee of Genoa, Italy, and of the National Institutes of Health.

Terry L. Orr-Weaver, has been named to the Latham Family Career Development Chair in the Whitehead Institute/Biology Department. Orr-Weaver focuses her research on genes that regulate cell growth and cell division in *Drosophila*. She and her associates have characterized three genes that affect the distribution of hereditary material during the process by which chromosomes are separated during the formation of egg and sperm cells; identified two mutants in which the unfertilized *Drosophila* egg behaves as if it has been fertilized; established a timetable for the pattern of DNA replication during embryo formation; and furthered development of a model system for studying the regulation of DNA replication. ... **Alan D. Grossman** has been named to the Whitehead Career Development Chair in biology. Grossman has been recognized for his research in microbial physiology and genetics and for his work as an advisor to undergraduates. He is interested in furthering the understanding of the regulation of gene expression and differentiation. He studies these problems in the relatively simple organism *Bacillus subtilis* because it allows for integration of molecular, genetic, biochemical, and physiological approaches and offers the opportunity for understanding regulatory processes in the whole organism.

Willard D. Nalchajian, MPH '42, of Chelsea, Mass., died on February 10, 1992. He was a physician in the city of Chelsea for many years. Nalchajian was also a member of the American Medical Association and the Everett Medical Association.

VIII PHYSICS

Yun-Tung Lau, PhD '88, writes: "I am continuing my research at NASA Goddard Space Flight Center. It has been quite exciting to use the high-performance computers and advanced visualization techniques there." ... The Phi Beta Kappa Society has named **Daniel Kleppner**, the Lester Wolfe Professor of Physics at MIT and associate director of the Research Lab of Electronics, as one of 13 visiting scholars for 1992-93. The scholars travel to colleges and universities for two-day visits. The program was begun in 1956 to enable undergraduates to meet with distinguished scholars in diverse disciplines. Kleppner, a member of the National Academy of Sciences, was awarded the Davisson-Germer Prize and the Lilienfeld Prize of the American Physical Society, as well as the Meggers Award of the Optical Society of America. He has written *Introduction to Mechanics* and *Quick Calculus*. ... MIT has received \$50,000 for research related to the development of the Superconducting Super Collider in Texas. The grant is part of a \$100 million R&D program funded by the Texas National Research Laboratory Commission, the Texas agency for the SSC. The money awarded to MIT, the lead institution of a consortium that includes Columbia University and the University of Washington, will be used to develop and test

liquid and solid xenon and krypton detectors, using both scintillation and ionization signals. The principal investigator is **Min Chen**, Course VIII professor.

From Troy, N.Y., **Richard L. Fork**, PhD '63, reports: "I am a professor of physics at Rensselaer Polytechnic Institute and am currently working on architectures for lasers producing ultrashort optical pulses." ... **Laurence J. Campbell**, '59, SM '61, has been appointed program manager for the



L.J. Campbell

assistant professor, has been selected by the National Science Foundation to receive a Presidential Young Investigator Award. The award finances research by faculty members near the beginning of their careers, helping colleges and universities attract outstanding young PhDs who might otherwise pursue non-teaching careers. Hewitt's field of study is astrophysics.

Edward N. Strait, Jr., PhD '48, of St. Paul, Minn., died on November 12, 1991. In 1965 Strait began teaching at Macalester College, serving as a professor of nuclear physics and electronics. He also held the post of chair of the school's Department of Physics and Astronomy. Strait's research interests included accelerator-based low energy nuclear physics, neutron activation, and proton-induced X-ray emission. He established Macalester's Nuclear Physics and Accelerator Lab. In 1978 he co-wrote *Modern Physics for Scientists and Engineers*, a book published by Macmillan. Strait served as an MIT research associate for two years upon graduation. He spent 15 years as an associate and assistant professor of physics at Northwestern University in Chicago and was director of the school's nuclear research lab for 10 years. During his first years at Northwestern, Strait designed and supervised construction of a 5-million-volt pressurized Van de Graaff accelerator. He was a member of Phi Beta Kappa, the American Association of Physics Teachers, the American Physical Society, and various other professional and academic groups.

IX BRAIN AND COGNITIVE SCIENCES

Michael I. Jordon, Course IX assistant professor, has been selected by the National Science Foundation to receive a Presidential Young Investigator Award. The award finances research by faculty members near the beginning of their careers, helping colleges and universities attract outstanding young PhDs who might otherwise pursue non-teaching careers. Jordon's field of study is cognitive sciences.

X CHEMICAL ENGINEERING

H.A. (Ric) Ricards, SM '41, sends word from Houston: "Last year, my wife and I drove from Texas to Maine and back, visiting friends and sites of our lives years ago. Also videotaped a historical record. This included my first visit to the MIT campus and the old graduate house which was relatively new in 1939 when I entered graduate

school in Course X. Visited classmate **Herb Hirschland**, SM '41, and his wife in Connecticut. Sad to learn **Edward C. Brown**, SM '40, in Ontario died recently. Back here in Texas **Joseph Finger**, SM '41, has retired to the hill country but travels still as a consultant in golf course architecture. All of the above were in Practice School X-A '40 with me and finished the SM in '41 to join the WWII effort. I have been retired from Exxon for 10 years now and moved back to Houston. We are in good health, we're active, and we travel—spending much of our time in England. I'm also busy writing a 1,000-page book on the history of our family. . . . **Julio Fernandez**, SM '81, reports from Montevideo, Uruguay: "I have left Ancap after 14 years. I'm now with Tea Deloitte & Touche as a consulting manager." . . . News comes to us about **Margaret Nemet-Mavrodin**, SM '73, ScD '77, who lives in Cherry Hill, N.J. She has two daughters, one in junior high who wants to pursue a career in the sciences. Her 8-year-old would like to become a doctor.

Joe Paterno, SM '65, has accepted the position of director of the State of New Hampshire's Industrial Research Center at the University of New Hampshire. The center will align the research capabilities of both UNH and Dartmouth College with small and mid-sized industries. Industrial contributions will be matched by state funds on approved projects. Formerly, Paterno was VP for R&D in the abrasives division at Norton Co. in Worcester, Mass. . . . **Pamela B. Jackson**, '74 (V), '75, SM '75, has been given the Dean's Award at



P.B. Jackson

the Sixth Annual Black Engineer of the Year Award Conference. Jackson, who also holds an MBA, is the manager for film integrated circuits at AT&T Merrimack Valley Works in Massachusetts. In this capacity, she is responsible for manufacturing operations, product design, process development, and engineering for the film integrated circuit business. Her organization is comprised of more than 500 employees and generates over \$50 million in annual revenues. Her group is also responsible for the elimination of chlorofluorocarbons and chlorohydrocarbons from the manufacturing process she manages. Jackson has been active in the Bell System Women and Minorities in Engineering Program, serving as a role model and talking to many junior and high school students about careers in engineering and science. Most recently in New England, she volunteered to teach chemistry on Saturdays to minority and female students through the Science and Technology Engineering Pre-College Studies Program (STEPS). . . . **James T. Cobb, Jr.**, '60, an associate professor in the Department of Chemical and Petroleum Engineering at the University of Pittsburgh, has been named a Fellow of the American Institute of Chemical Engineers. He was cited for "his expertise as an educator and researcher in zeolite, catalysis, coal gasifier modeling, and the beneficial use of incinerator ash." Cobb has served on the University of Pittsburgh faculty for 22 years. He has also served as director of the school's Energy Resources Program for 12 years and cochair of the Program Committee of Pittsburgh Coal Conference for 10 years.

The following have been elected to the National Academy of Engineering: **Elisabeth M. Drake**, '58, ScD '66, associate director of MIT's Energy Laboratory, for "leadership in industrial safety and risk management"; **Robert S. Langer**, ScD '74, the Germeshausen Professor of Chemical and Biochemical Engineering at MIT, for "innovative research in chemical aspects of biomedical engi-

neering, particularly in the field of controlled release of macromolecules and proteins"; and **Warren E. Stewart**, ScD '51, the McFarland-Bascom Professor of Chemical Engineering at the University of Wisconsin at Madison, for "leadership in chemical engineering research and the application of advanced mathematical and numerical methods." . . . **Linda G. Cima**, the Henry L. Doherty Assistant Professor in Ocean Utilization, has been selected by the National Science Foundation to receive a Presidential Young Investigator Award. The award finances research by faculty members near the beginning of their careers, helping colleges and universities attract outstanding young PhDs who might otherwise pursue non-teaching careers. Cima's field of study is biomedical engineering.

Seven faculty members from the Department have been elected founding Fellows of the American Institute for Medical and Biological Engineering in recognition of their significant contributions to the field. They are: Professors of Chemical Engineering **Clark K. Colton**, PhD '69, **William M. Deen**, and **Charles L. Cooney**, SM '67, PhD '70 (XX), also professor of biochemical engineering and associate director of the Biotechnology Process Engineering Center; **T. Alan Hatton**, the Chevron Professor of Chemical Engineering and director of the David H. Koch School of Chemical Engineering Practice, **Robert S. Langer**, ScD '74, the Germeshausen Professor of Chemical and Biochemical Engineering, **Gregory Stephanopoulos**, professor of chemical engineering and associate director of the Biotechnology Process Engineering Center, and **Daniel I.C. Wang**, '59, SM '61 (XX), the Chevron Professor of Chemical Engineering and director of the Biotechnology Process Engineering Center. The AIMBE was established, with the help of funding from the NSF, to develop a new organization that would unify the medical and biological engineering community in the United States.

Chien-Hou Chang, ScD '50, of Tianjin, China, died on January 14, 1991. Chang was known by the name Zhang Jianhou at the time of his death. Jianhou was a professor for more than 40 years at Southwest University, Nankai University, and Tianjin University. He was chair of the Department of Chemical Engineering at the latter. According to one of his colleagues, he was "an outstanding expert in chemical engineering and selflessly dedicated all his energies throughout his life to the establishment of many disciplines in the department, the university, and to the education cause of the people and the nation." Jianhou had many works published on chemical engineering thermodynamics and the measure of chemical engineering thermophysics. . . . **Edward C. Brown**, SM '40, of Westmount, Quebec, died on December 26, 1991, following an unexpected emergency operation. He retired several years ago from Du Pont, Canada.

Colonel **William S. Hutchinson, Jr.**, SM '49, (ret.) of Jacksonville, Fla., died on February 2, 1992. His career in the U.S. Army included command of the 93rd Chemical Mortar Battalion, which provided artillery support for Darby's Rangers in Africa, Sicily, and Italy. He also commanded the 503rd Airborne Infantry Division in Munich, Germany, and served as chief of staff of the 2nd Infantry Division in Korea. Hutchinson also served on the Atomic Energy Commission, worked on the Manhattan Project, and spent five years working in nuclear weapons effects testing in Los Alamos, the Nevada Test Site, Sandia Base Eniwetok Atoll in the Pacific, and Southern Command NATO Headquarters in Naples, Italy. He received the Legion of Merit with Oak Leaf Cluster Silver Star, Bronze Star, Purple Heart, and the Military Valor Cross from the Italian government. Upon retirement in 1966, he was employed by the Cornell Aeronautical Lab to work in Bangkok on the local problems with Communist infiltration. He served as deputy director of Public Works in

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Hurd C. Willett

1903-1992

Hurd C. Willett, an MIT meteorologist widely recognized for his role in developing five-day weather forecasting techniques and for his attempts at very-long-range forecasting, died March 26 at a West Concord nursing home. He was 89.

Professor Willett came to MIT in 1929, where he joined the newly established meteorological section of the Department of Aeronautical Engineering. He specialized in climatic fluctuations, variable solar influences, and long-range weather forecasting. In the 1930s, he was instrumental in the development and adoption of the polar-front theory of five-day weather prediction by the Weather Bureau. Starting in the late 1950s, Willett focused on discovering the basic patterns behind weather conditions. He developed a theory that climatic conditions on earth follow a cyclical pattern that will become clearer as statistical records extend over longer periods of time. To back up his theory, he did exhaustive surveys of weather conditions going back to pre-historic times. Willett retired from teaching in 1968, and then continued his research as professor of meteorology emeritus for another 20 years.

Born in Providence, R.I., Willett grew up near Pittsburgh and earned a BS from Princeton and a doctorate in meteorology from George Washington

University in. His thesis, "The Forecasting of Smoke, Haze, and Fog" became the classic in the field and was translated into every major language.



During World War II, he trained meteorologists for the military and served as a consultant at air bases in Europe and Canada. In 1951 he received a plaque from the American Meteorological Society for his research in upper-atmosphere wind patterns.

In a *Boston Globe* obituary, Dorothy Willett recounted an anecdote from 1985, when MIT asked her husband to predict the weather for Ronald Reagan's inauguration. They were trying to decide whether to send a band. Willett told MIT not to send drummers because it would be "bitter, bitter, bitter cold." Actually, his wife said, he added "goddamn cold."

Later, when Mrs. Willett asked her husband what method he had used to come up with such an uncannily accurate forecast, he replied that he had guessed at it and hoped it would be bitter cold because he disliked the president.

Among more scientifically arrived at (but equally accurate) predictions, the *Globe* noted, was one made to a society of insurance agents in 1956 that a rash of destructive hurricanes would cease by 1960 and another to the state of Utah in 1971 that the Great Salt Lake would rise in the 1980s. □

Jacksonville for four years and served as president to both the Jacksonville Sons of the American Revolution and the English Speaking Union. He was a member of several organizations including Psi Upsilon Fraternity. . . . The Association of Alumni and Alumnae has been notified of the following deaths: George A. Revell, SM '35, of Cornwall, Ontario, in 1991; Willem E. Lower, SM '49, of The Netherlands, in 1990; and René E. Unson, SM '57, of the Philippines, in February 1991. There was no further information provided.

XI URBAN STUDIES AND PLANNING

Shih-Liang Tu, MCP '86, sends word: "In January 1991, I started working as a lead environmental engineer in the San Francisco Bay area for CH2M Hill, an environmental and civil engineering consulting firm. I have worked on various projects including an environmental impact report of the Chevron Chemical hazardous waste incinerator in Richmond; a leachate treatment pilot plant for the Acme landfill in Martinez; and environmental

evaluation and legislative and institutional review for the Redwood City Water Reclamation Master Plan. During 1991 I made several trips to Taiwan. I wrote a strategy paper on business development and organizational expansion for CH2M Hill's Asian business operation. In November 1991, I was the assistant project manager of the Chang-Bin Industrial Park Pollution Control Master Plan for Taiwan-Industrial Development Bureau, which involved setting emission standards and design criteria for the industries, designing monitoring systems, and instituting an environmental protection center. On the non-profit front, I was named chair of the publication committee of the Chinese American Environmental Protection Agency, a citizens' group based in the Bay Area with some 120 members working in the fields related to environmental professions or research. I am now leading an editorial team that is responsible for the compilation and publication of a monograph with the quarterly magazine *China Environmental Protection*. This special issue, entirely devoted to the papers and articles of overseas Chinese environmental professionals, will be published in Taipei by Spring 1992. Late last year I

was transferred to Taiwan." . . . Edward H. Kaplan, SM '79, SM '82 (XVII), MCP '79, PhD '84, writes: "I received the Connecticut AIDS Leadership Award from the Commissioner of Health Services for evaluating the New Haven needle exchange program, and for developing mathematical models of the AIDS epidemic."

Irene D. Jenkins, SM '89, reports: "I am currently working as honorary development coordinator for the Rhode Island Housing and Mortgage Finance Corp." . . . Julie A. Moir Messervy, MCP '78, a garden design consultant at Messervy Associates in Wellesley, Mass., has written *Contemplative Gardens* (Howell Press, 1990). She is also a contributing editor to *Connoisseur* magazine. . . . Philip B. Herr, MCP '59, Course XI adjunct professor, was recently appointed to the National Trust for Historic Preservation's board of advisors. Herr owns a consulting firm, Philip B. Herr and Associates, which specializes in land-use planning, housing, development control, and impact analysis. Since 1988, Herr has been the principal consultant for "Project Prepare," a program supported by the National Trust that researches and develops tools for preservation-related aspects of growth management in seven northeastern states.

Samuel J. Cullers, MCP '52, is in the third year of a four-year term on the Commission on Teacher Credentialing for the State of California, where he has been serving as chair of the Planning and Research Committee. Cullers, president of Samuel J. Cullers & Associates, an environmental planning and development consulting firm in Sacramento, is a public member of the Commission. In a Commission newsletter, he states: "My experience in the public and private sectors dealing with urban and regional issues has convinced me that nothing is more critical than the preparation of the next generation. We on the Commission will continue to work on the challenging assignment of maintaining and enhancing the personal qualities and educational capabilities of California's teachers." . . . Barbara Gomes-Beach, MCP '85, has



been appointed executive director of the Multicultural AIDS Coalition in Boston. Gomes-Beach joins MAC after working for the Dorchester Bay Economic Development Corp. In 1985, while in graduate school, she founded and managed B.J. Enterprises, a consulting firm. In addition to her work in community development, she

has also been involved with the NAACP, the Black Political Task Force, and the Boston Chapter of the National Business League. MAC's mission is to advocate on issues of HIV infection and AIDS on behalf of people of color by offering assistance and programs that are racially and culturally sensitive and linguistically appropriate. Of MAC's 10 employees, 8 are bilingual, including Gomes-Beach, who speaks Cape Verdean and Portuguese.

Clinton C. Bourdon, PhD '83, of Ipswich, Mass., died on February 2, 1992. He worked most recently for the Berkshire Health System in Pittsfield, Mass. He was an avid horseman, frequently riding on the beach.

XII EARTH, ATMOSPHERIC, AND PLANETARY SCIENCES

David D. Jackson, PhD '69, sends word from Los Angeles: "I am still a professor of geophysics at UCLA. This year I was elected as president-elect of the Seismology section of the American Geo-

physical Union, vice-chair of the board of directors of the Southern California Earthquake Center, and member of the steering committee of the University's Navstar Consortium."... **John B.**



J.B. Southard

members are appointed for 10-year terms and receive \$5,000 each year in discretionary funds for support of educational activities, research, travel, and other scholarly expenses. Exxon Educational Foundation has given a \$1-million gift and MIT has committed \$10 million in endowment to the program. "Through my UROP project he convinced me to pursue geology as a course of study. He gave me enough freedom to work with my own ideas that I could call the project my own, and at the same time he was able to guide me and teach me with such subtlety that my learning experience seemed to be my own discovery" ... "When I took his courses, I was amazed to hear that he conducts the research of a full professor as well as teaching his courses. I still don't know how he manages it" were comments submitted to the provost about Southard. ... **Steven R. Bratt**, PhD '85, writes: "I am now director of Geophysical Systems and Support at the Center for Seismic Studies in Arlington, Va. I have three girls (Abby, 5; Tory, 4; and Becky, 2) and another on the way."

Vance A. Myers, SM '47, of Fairfax, Va., died on February 9, 1992. Myers served the U.S. Weather Service for 40 years. He began his career in 1940 as a weather observer in Atlanta. During WWII he served in the same capacity with the U.S. Coast Guard. From 1945-49, he served as a weather forecaster in Knoxville, Tenn., and from 1949-51, in Washington, D.C. In 1951, he was appointed as research meteorologist in the Hydrometeorological Branch of the National Weather Service. From 1955-60, he served as assistant chief, and from 1961-69 as chief. From 1972-79, he served as chief of the Special Studies Branch. Myers retired from the government in 1979, and was engaged in private consulting until his death. He was a certified consulting meteorologist and was elected a Fellow of the American Meteorological Society in 1992. During his lifetime, he wrote numerous technical reports and journal articles on extreme rainfall and hurricane characteristics for engineering design. Myers was a member of several organizations and worked as an advocate for world peace and hunger issues. ... The Association of Alumni and Alumnae has been notified of the following deaths: **Freeman K. Keyte**, '66, of Nepean, Ontario, on February 19, 1992, and Lieutenant Colonel **Gabriel Palmero**, '52, of Washingtonville, N.Y., in 1991. There was no further information provided.

XIII OCEAN ENGINEERING

Richard J. Martin, SM '85 (II), OCE '85, writes: "I retired from the Navy after 20 years of active duty. I'm currently employed at the Applied Research Lab at Penn State University as an associate research engineer, and on detail to the Office of Naval Technology Undersea Warfare Technology Office in Arlington, Va." ... Lieutenant Commander **William L. Glodt**, NE '49, sends word: "I retired from Vitro Corp. after 28 years. I'm in a

new house in Glenwood, Md. I'm still an amateur radio operator and I enjoy computer systems." ... Captain **Jay M. Cohen**, SM '72, OCE '72, reports: "I returned to Norfolk, Va., in December 1991 from a five-month deployment in the Persian Gulf, serving as C.O. of the submarine tender USS L.Y. Spear. Over four dozen surface ships, from minesweepers to aircraft carriers were tended." ... **Philip Wingard**, OCE '91, has joined The Glosten Associates in Seattle, Wash., as an ocean engineer. Wingard is currently working on the dynamic analysis for the replacement I-90 floating bridge. While at MIT he researched remotely controlled



P.A. Wingard

underwater vehicles. The firm provides consulting in ship design, marine engineering, propulsion systems, ship dynamics, cargo engineering, construction management services, hydrodynamics analysis, and transportation planning. ... **Peter Quigley**, '85, founder and president of Fiberspar, Inc., in West Wareham, Mass., is in the news. His company is manufacturing sail battens for the America's campaign, a group leading the charge to defend the America's Cup in San Diego. Battens are the flexible inserts used for sails. Fiberspar, which already manufactures carbon fiber components for windsurfers, is expanding into yachting. Carbon fiber is a super strong, lightweight glass fiber which is taken from rolls like a textile and eventually rolled and baked into tubes. The battens for the America's boats are from 10 to 33 feet long and are about one inch in diameter.

Commander **John W. Green**, SM '56, USN (ret.), of Livermore, Calif., died on June 25, 1991. Green's first tour as a naval aviator was with VP-47 where he was a patrol plane commander. He joined VP-44 as patrol plane commander and ordnance officer where he established the first sea-plane nuclear delivery capability in the Atlantic Fleet. From 1958-60, he was nuclear weapons officer. Green was assigned as a military research associate to the director of the Lawrence Livermore National Lab and was the thermonuclear design physicist for the Polaris W-58 warhead throughout its development. Next came assignments as strike warfare and weapons officer and air nuclear plans officer, where he developed the first comprehensive nuclear standard operating procedures for the Atlantic command. He served his final tour on active duty in charge of nuclear weapons requirements in the Atomic Energy Division of OPNAV. Upon his retirement, Green returned to the Lawrence Livermore Lab where he specialized in the analysis of foreign nuclear weapons capabilities. ... Commander **Theodore E. Gerber**, SM '46, USN (ret.), of Guilford, Conn., died on February 7, 1992. He was a naval architect for the U.S. Navy for 20 years and then became superintendent of shipbuilding for the Mobil Corp. for 20 years. He retired in 1982.

The Association of Alumni and Alumnae has been notified of the following deaths: Captain **Charles E. Leising**, SM '46, USCG (ret.), of Boiling Springs, Pa., on December 15, 1991; **Gabriel T. Kerekes**, '60, in 1991; Captain **William Nicholson**, SM '48, USN (ret.), of Easton, Md., in 1992; and Rear Admiral **Philip W. Snyder**, SM '32, in 1990. There was no further information provided.

XIV ECONOMICS

Chandler Harrison Stevens, PhD '67, writes: "I am organizing the new Georgia Center for Advanced Telecommunication Technology and

helping plan high-tech and high-touch applications of technology in the 1996 Olympics to be held in Atlanta." ... **Lloyd S. Beckett III**, SM '82, is a pipefitting foreman at the Bath Iron Works in Bath, Me. ... The National Academy of Engineering has elected **Armand V. Feigenbaum**, SM '48 (XV), PhD '51, to membership in the Academy. Feigenbaum, president and CEO of General Systems Co., Inc., in Pittsfield, Mass., was cited for "developing concepts of 'Total Quality Control,' and for contributions to 'Cost of Quality' and quality systems engineering and practice." ... **Nicholas S. Perna**, PhD '69, senior VP and chief economist at Connecticut National Bank, has been speaking to several different groups. Last October in Wellesley he gave a talk entitled "The National and Regional Economy—What's Next?" In November he spoke on the economic outlook at a Cheshire (Conn.) Chamber of Commerce luncheon and later that month spoke at the Financial Executives Institute's dinner meeting in Ridgefield, Conn. His topic at the latter was "Will the Grinch Steal Christmas and the New Year Too? A Look at the Connecticut and United States Economies." ... **George W. Shuster**, SM '69, has been promoted to president and CEO of Cranston Print Works Co. in Webster, Mass. Shuster began his career with the company in 1977 as secretary and general counsel. Prior to his career with Cranston, Shuster was a partner in the law firm of Edwards & Angell of Providence, R.I. He also served as an officer in the U.S. Navy. Cranston is the oldest textile printing operation in the United States and is the largest such operation in the world.

Ian Ayres, PhD '88, a lawyer and economist specializing in corporate law, has joined the Stanford Law School faculty as a full professor. Ayres previously held a joint appointment as an associate professor at Northwestern University Law



I. Ayres

School and as a research fellow with the American Bar Foundation, both in Chicago. He spent the 1991 fall term at Yale University as a visiting professor of law. He is known for his work in areas ranging from accident law and the economics of contracts to consumer law and discrimination on the basis of race and sex. Ayres recently published "Fair Driving: Race and Gender Discrimination in Retail Car Negotiations" in the *Harvard Law Review*. Based on Ayres' American Bar Foundation research study, the article showed that the proffered price of an automobile can vary significantly depending on the race and sex of the shopper. Car dealers (at least in the study area of Chicago) offered the highest prices to black males and black females, and the lowest to white males, even though all buyer-testers followed an identically scripted bargaining strategy. ... **Paul R. Krugman**, PhD '77, Course XIV professor, has received the prestigious John Bates Clark Medal, given biannually by the American Economic Association to the economist under 40 who has made the most important contributions to economics. Krugman is an international economist who is best known to the public through his book, *The Age of Diminished Expectations*, which discusses the economic problems facing the United States in the coming decades. Krugman is in good company—he is the fifth member of the department to receive the Clark Medal.

Stanley Fischer, PhD '69, has been named to the Elizabeth and James Killian 1926 Professorship at MIT. Fischer, one of the world's leading macroeconomists, served as VP and chief economist of the World Bank from 1988-90. He was selected for

the Killian Chair in recognition of his "outstanding achievements in economics and his distinguished leadership in teaching and public service." The professorship was established in 1966 by members of the Class of 1926 to honor James R. and Elizabeth Killian for their many years of outstanding service to the Institute and commemorates Dr. Killian's extraordinary work in advancing the human and scientific interests of the nation. Killian, a member of the Class of '26 who died in 1988, was president of MIT from 1949-59 and the nation's first presidential science advisor, serving in the Eisenhower administration. He was chair of the MIT Corporation from 1959-71. Fischer, a member of the department since 1973, has defined the field of macroeconomics. Fischer has cowritten *Macroeconomics* with MIT colleague Rudiger Dornbusch, which is the leading textbook in the field and is used throughout the world. He has written and edited six other books, including *Indexing, Inflation, and Economic Policy* (1986) and more than 100 articles.

XV MANAGEMENT

M. Cory Zwerling, SM '85, writes: "Good day mates! I've been working as a worldwide product manager for Bristol-Myers Squibb's Pharmaceutical Group in Princeton, N.J. In March, I'm heading 'Down Under' to Melbourne, Australia, to assist in launching a new product. If you are in the neighborhood, please give me a call." . . . **Robert J. Luck**, SM '89, sends word: "My wife, Sahya, gave birth to a daughter, Marisa, on March 10, 1991. I have just been assigned to run a new division for Tennant Co. in Japan, so Marisa will have a chance to grow up bilingual." . . . **James D. Elkind**, SM '89, sends word from Harvard, Mass.: "My daughter, Katherine Elisabeth, was born on January 15, 1992. She brings welcome diversion from a multitude of home improvement projects as well as great joy and excitement. I'm now a planning manager at Teradyne Connection Systems in Nashua, N.H." . . . **Judy G. Young**, SM '82, was promoted to division manager of AT&T Consumer Billing Strategy in Basking Ridge, N.J. . . . **Beth Krasna Casella**, SM '83, writes from Bangkok: "Since January 1991, I have been turning around and managing the Industrial Management Co., the consulting subsidiary of the Industrial Finance Corp. of Thailand, the local development bank." . . . **Haruyoshi Mabuchi**, SM '88, is a strategist and manager of the Money Market Research Section of The Nikko Securities Co., Ltd., in Tokyo. . . . From Concord, Mass., **Steven R. Kanner**, SM '74, reports: "I am now marketing Medical Master—The Doctor's Workstation, a new frontier software for the entire practice of medicine. This has been a fascinating three-and-a-half year project." Kanner is an internist at RTJ Associates in Weston, Mass.

Michelle de Nevers, SM '81, sends word from Washington, D.C.: "My second son, George, was born in October 1991. I'm now working as coordinator for Latin America for projects funded under the Global Environmental Facility, a grant fund setup with contributions mainly by OECD countries." . . . From Belmont, Mass., **Oscar Hauptman**, PhD '86, writes: "I was elected by the Technology and Innovation Management Division of the Academy of Management for the national program chair-elect post. In automatic progression, I'll become the program chair in 1993 and division chair in 1995." . . . **Cameron L. Smith**, SM '65, reports: "I've just taken an exciting new job as director of marketing and communications for Earthwatch. We finance scientific expeditions by inviting paying volunteers to participate in the fieldwork. Interested? Call me at 617-926-8200!" . . . **Mary A. Spyropoulos**, SM '84, sends word: "After graduation I joined Andersen Consulting in their L.A. office. While with Andersen I worked

on large systems development projects in cities across the country. It was fun at first, but after five moves in six years, I was tired. I married Jeff Stocker in November 1989. We met while we were working on a project in Kansas City. I left Andersen in 1990 and joined the International Systems Group of the Bank of California in San Francisco. We enjoyed San Francisco, but decided we needed to be closer to our families, so last year we moved to Chicago, where we are closer to Jeff's family and my sister. Jeff is a manager at Andersen and I am now working at the Chicago Mercantile Exchange in the System Architecture Group. Except for the weather, we and our two cats are enjoying life in Chicago."

Marco A. Viola, SM '90, writes: "I have been working in New York for Booz-Allen since August 1991. When this mention appears, we will probably have moved back to Spain in April (who knows!!). I have also been working on growing my family with excellent results: a little baby girl (named Camila) was born on November 20, 1991 in the U.S. She's already enrolled in two frequent flyer programs!!" . . . **Juan A. Chacin**, SM '87, sends word: "I left McKinsey & Co. after four years in the firm to become president of a leading oilfield service company in Venezuela. The company, Servicios de Pozos Anzoategui, is a 500-employee, \$10-million-a-year operation. We have plans to expand it to a \$50-million-a-year operation in two years, through internal growth, joint ventures, and acquisitions." . . . **Laurie Powers Freeling**, SM '85, reports: "I have recently been made a director of the Prudential Corp. in the U.K. (the largest life insurer in Europe—no relation to the U.S. company), and am a 'first' for them on several counts: first woman, first under the age of 40, and first non-Brit (I'm American)—and first new mother (my husband Anthony, whom I met while at McKinsey, and I had our first son on December 26! I was eight months pregnant when appointed to director!). I joined Pru after a stint at Morgan Stanley here in London doing corporate finance for insurance companies, following my departure from McKinsey in 1989."

Kate Subak, SM '87, writes: "I married Doug Eberlee, a VP at Salomon Brothers, Inc., on Cape Cod last September. Currently, we are both enjoying living in Toronto and would love to see any Sloanies passing through." Subak is an engagement manager at McKinsey & Co. . . . From Hershamp, Pa., **Jeff Eder**, SM '82, writes: "I was recently promoted from director of finance for Decision Data's service division to director of mergers and acquisitions for the company. With all the travel for work, Billie Jo working full-time, and my daughter, Marissa, nearing three, life is pleasantly hectic. If you know of any good companies for sale, give me a call." . . . **Vicki M. Bier**, PhD '83, is teaching risk analysis and stochastic processes as a professor at the University of Wisconsin at Madison. . . . **Susan Anderson**, SM '91, who is living in Somerville, Mass., started a new job working for a small software development/consulting company advising freight carriers. . . . **Claudette Fisher-Johnson**, SM '88, sends word: "My husband, Ridgely, and I had a son, Bennett Cuper Johnson, born January 17, 1992. We live in London where I am with Bankers Trust and Ridgely is with Shell." . . . **Neil L. Cohen**, SM '86, has been named executive VP and CFO of Ambase Corp. in Morristown, N.J. Previously, Cohen was VP at Dillon, Read & Co. in New York City. . . . **Lawrence S. Daniels**, SM '66 (II), SM '66, is VP for marketing and business development at Biogen, Inc., in Cambridge, Mass. Previously, he was staff VP for corporate strategy at Allied-Signal Corp. in Morristown, N.J.

Deborah Gaines, SM '86, has been named a VP at Shawmut Bank. She had been a loan officer of the Middlesex Region for the Chelsea, Mass.-based bank. . . . **Robert M. Metcalfe**, '69, inventor of the widely used Ethernet networking technology and founder of 3Com Corp., has been appointed

ed publisher and CEO of InfoWorld Publishing Corp., publishers of *InfoWorld*, a leading newsweekly for corporate PC managers. . . . **Benjamin Brussell**, SM '85, has joined Price Waterhouse's Corporate Finance Group's Northern California office as director, a senior executive



B. Brussell

position. Prior to joining the Price Waterhouse San Francisco office, Brussell was a VP for corporate finance at Solomon Brothers, Inc. He then served as an independent consultant, providing strategic and financial advisory services to companies in the technology, health care, and media industries. . . . **Ann L. Eckert**, SM '81, has been appointed director of marketing at Candela Laser Corp. in Wayland, Mass. Eckert will be responsible for all marketing activities for the company's three principal product lines, which includes lasers for minimally invasive therapies for plastic surgery and dermatology. Prior to her appointment, Eckert was the group product director for ophthalmology at the company. . . . **Christopher B. Alt**, PhD '82, has been appointed professor of finance at Babson College in Wellesley, Mass. Alt was most recently CFO and treasurer of Cortex Corp. in Waltham, Mass. He has written on such business issues as taxes and short term supply and demand.

Patrick Rivelli, Jr., SM '91, recently married Jennifer A. Morrison. Rivelli is a consultant at Bain & Co., in Boston. . . . **Dennis B. Sullivan III**, SM '86, wrote an article that appeared in the December 1991 issue of *Bay State Business Magazine*. The article, entitled "Sale of Your Company? Plan for a Successful Outcome," outlines the advantages of a tax-free merger. Sullivan works at Siegrist, CPAs in Wellesley, Mass., where he provides business advisory, tax, and valuation services. . . . The Sloan School of Management has received the Enterprise Network Excellence scholarship award. The award recognizes achievements in enterprise networking that enhance profitability and efficiency and otherwise solve practical business problems. This year's \$7,500 unrestricted grant will provide financial support for a graduate student studying the effect of information technology on management issues. The grant was accepted on behalf of the Sloan School by **Stuart F. Madnick**, '66, SM '69, EE '71, PhD '72 (VI), SM '69, the John Norris Maguire Professor of Information Technology and Leaders for Manufacturing Professor.

Lotte Bailyn, professor of organizational psychology and management and a member of the Sloan faculty since 1969, has been named to the newly endowed T. Wilson Chair in Management. **T. A. Wilson**, '53, retired chair of The Boeing Co., endowed the chair in honor of his year at MIT as a member of the Sloan Fellows and his continuing association with the Institute since that time. Bailyn is the first woman to hold a chair at Sloan. She has focused much of her work on the study of the relationship between work/career and family, starting with a major MIT alumni/ae survey and following up with research on men and women in various technical careers. She found a greater diversity of technical careers in engineering than had previously been observed, and she found that patterns of autonomy needs in research labs were different from what the prevalent managerial assumptions often were. Bailyn's recent effort to examine how human resource policies and organizational cultures inhibit needed patterns of accommodation such as work at home, part-time work, sabbaticals, and slower career trajectories has received attention from policy makers and promises to be a critical area of future work, espe-

cially as the diversity of the work force and organizational structures increases. . . . **Chi-Fu Huang**, a member of the finance faculty at Sloan since 1983, has been named the J.C. Penney Professor of Management. Huang has made major contributions to the theory of financial economics, and has written on dynamic general equilibrium theory, intertemporal utility theory, and the theory of individual consumption and portfolio decisions. The results of his research justified some key assumptions underlying much of the modern work on asset pricing.

Sloan Fellows

James C. Foster, SM '85, has been named corporate VP at Bausch & Lomb. He continues as president and COO at Charles River Labs in Wilmington, Mass. . . . **Robert N. Pratt**, SM '69, has been named president and COO of Alta Gold Co., a Salt Lake City-based mining company. He has been a director of the company since 1988. Pratt, who has been working in mining for 40 years, will be based at the company's operations in Ely, Nev. . . . **John W. Schmits**, SM '80, has been named president and general manager of the Eastman Kodak Co.'s Estek Products Division in Charlotte, N.C. Estek manufactures semiconductor inspection apparatus. Schmits joined Kodak in 1965 and has held a number of domestic and international management positions in design, manufacture, and commercialization of optical, consumer,



O.C. Donald

health, and industrial products. . . . **Odie C. Donald**, SM '88, has been named president of BellSouth Mobility, Inc., a division of BellSouth Cellular Corp. that provides cellular service and equipment in the Southeast. Donald was previously VP of administration for BellSouth Cellular Corp., where he was responsible for human resources, support services, training and development, external affairs, and transition management. During Donald's 18-year career in telecommunications, he has held management positions in business planning and administration, regulation, human resources, customer service, and sales and marketing. . . . **A. Thomas Young**, SM '72, has been elected to the National Academy of Engineering. Young, president and COO of Martin Marietta Corp., in Bethesda, Md., was cited for "technical leadership in organizing and directing national space and defense programs, including the Viking program."

Richard E. Brackeen, SM '75, of Great Falls, Va., died on February 5, 1992. Brackeen, a longtime aerospace executive, was the former CEO of the Fairchild Space and Defense Corp., a unit of the Matra Group, a Paris-based international aerospace concern. After he left Fairchild in March 1991, he served as a consultant to several space and military companies and had been a director of CTA, Inc., an aerospace company in Rockville, Md. Before joining Matra in February 1989, Brackeen spent 22 years with the Martin Marietta Corp., holding various corporate positions. In 1967, he had joined the company as program director for the space shuttle recovery system and rocket aircraft research. In 1980 he was appointed VP of business development for Martin Marietta's Astronautics Group, and in 1983 he became president of its Space Launch Systems Co. In 1986, he established and became president of Martin Marietta's Commercial Titan, Inc. . . . The Association of Alumni and Alumnae have received word that **Albert O. Riordan, Jr.**, SM '62, of Hornell, N.Y., died on January 23, 1992. There was no further information provided.

Senior Executives

Patrick J. Scollard, '76, sends word from Roslyn, N.Y.: "I joined St. Francis Hospital's heart center as its executive director and COO in February 1992." . . . **William T. O'Shea**, '87, has been named senior VP of the Network and Integrated Systems Group at the NCR Corp. He had been senior VP of the Network Products Group for the Dayton, Ohio-based firm. . . . **Andrew C. Knowles**, '76, is president and CEO of Artel Communications Corp. in Hudson, Mass. Previously he was president and COO of the company. . . . **Kirtland C. Gardner**, '79, is VP for operations at University Patents, Inc., in Westport, Conn. Prior to this new position, he was president and CEO of General Physics Corp. in Columbia, Md.

Daniel J. Cavanagh, '78, has been named president and CEO of Metropolitan Property & Casualty Insurance Co. in Warwick, R.I. He had been senior VP at the New York City-based Metropolitan Life Insurance Co. . . . **Andrew L. Lewis, Jr.**, '68, chair and CEO of Union Pacific Railroad in New York City, has been named to the board of directors of the FPL Group, Inc., in Juno Beach, Fla. . . . **Brian Rushton**, '72, has been promoted from VP to senior VP for R&D at Air Products & Chemicals, Inc., in Allentown, Pa. The British native joined the company in 1981. Rushton is president-elect of the Industrial Research Institute, whose member companies are responsible for managing over 85 percent of the annual industrial R&D expenditures in the United States. . . . **Syed M. Shahed**, '87, institute engineer at Southwest Research Institute, in San Antonio, Tex., has been elected a Fellow of the SAE, the engineering society for advancing mobility on Land, Sea, Air, and Space. He was cited for "his leadership in diesel engine research and technology and his research related to the formation of nitric oxide in high pressure combustion systems as applied to the reduction of diesel emissions."

Management of Technology Program

Bruce Gobioff, SM '84, and his family are back from Germany for good. He had been a manager of Test Support & Control for the IBM Corp. in Munchen, Germany. He is now a program manager at the IBM Corp. in Boca Raton, Fla. . . . **Ralph Salvucci, Jr.**, SM '86, is now chief support systems engineer for the Cockpit Integrated Product Team at Wright-Patterson AFB in Ohio. . . . **R. Eric Schmidt**, SM '87, is director of commercial satellite ventures at Space Systems/Loral in Palo Alto, Calif.

David Birnbach, SM '89, stopped by to visit with the staff in the MOT office. He is the business development manager for consulting services at Digital Equipment Corp. in Marlborough, Mass. . . . **Kenji Nozaki**, SM '89, graduated last year from the International Space University, an organization to train young space engineers around the world. He is now involved in the Lunar Habitation Project at Shimizu Corp. in Tokyo. . . . **Yoichi Sakamoto**, SM '91, is assistant counselor in the Planning Office of the Components and Devices Research Center at Matsushita Electric Industrial Co., Ltd., in Osaka, Japan.—Fay Wallstrom, Management of Technology Program, MIT, Room E56-304, Cambridge, MA 02139.

XVI AERONAUTICS AND ASTRONAUTICS

From Smyrna, Ga., **Anthony P. Hays**, SM '71, writes: "I returned to Lockheed after a brief stint at Boeing. I'm currently manager of the high-speed civil transport program." . . . **Florian G. Leroux**, SM '45, is a consulting engineer in the laundry and dry-cleaning field. . . . **Saty N. Atluri**, ScD '69, sends word from Atlanta, Ga.: "I was at the Institute from August 1990–May 1992 as the

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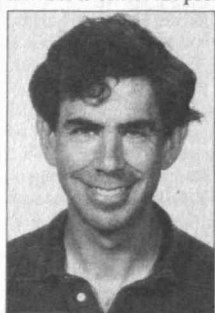
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Jerome Clarke Hunsaker Professor of Aeronautics in Course XVI. It was a very meaningful experience for me, as I had the honor of knowing Professor **Jerome C. Hunsaker**, SM '12 (XIII), ScD '23, during my graduate student days (1966-69) at the Institute. In fact, Professor Hunsaker asked the first question during the defense of my doctoral thesis. This otherwise very pleasurable experience at MIT was marred by some serious health problems that I developed in Cambridge in February 1991. I returned to Atlanta in May 1991, and my health is fairly stable, and I am awaiting some elective surgery in Boston in April-May 1992. Upon my return from Cambridge, Georgia Tech appointed me as an Institute Professor—one of a group of six that Georgia Tech appointed for the first time in its 107-year history. I still continue to be a Regents' Professor of Computational Mechanics. In December 1991 I was elected a Fellow of the American Institute of Aeronautics and Astronautics, and a Fellow of the Aeronautical Society of India, the country where I was born. In November 1991, the Japan Society of Mechanical Engineers awarded me its 1991 Computational Mechanics Division Medal for 'long-standing contributions to computational mechanics.' I still have an unfulfilled obligation as the Hunsaker Professor at MIT—I was scheduled to give the Minta Martin Lecture in April 1991—which I couldn't for health reasons. I will return to the Institute sometime after my health improves to give this lecture—which I very much want to do."

Astronaut candidate **Janice E. Voss**, SM '77 (VI), PhD '87, handed out NASA achievement awards to workers at Titeflex Corp. in Springfield, Mass. The workers were honored for their role in manufacturing metal and teflon hoses installed on space shuttle orbiters. Voss expects to receive a mission assignment sometime in 1992. . . . **Edward F. Crawley**, '76, SM '78, ScD '81, Course XVI professor, has been named a MacVicar Faculty Fellow. He is one of six professors recognized for



E.F. Crawley

their "exemplary and sustained contributions" to undergraduate education under a new program named for the late Margaret L.A. MacVicar, '64 (VIII), ScD '67 (III), the first dean of undergraduate education. Faculty members are appointed for 10-year terms and receive \$5,000 each year in discretionary funds for support of educational activities, research, travel, and other scholarly expenses. Exxon Educational Foundation has given a \$1-million gift and MIT has committed \$10 million in endowment to the program. "He is always thinking of ways to bring excitement, substance, and effectiveness to teaching at all levels" . . . "I know of no one who better typifies and lives up to the ideal of an MIT professor" were comments submitted to the provost about Crawley.

Ian Waitz has been appointed to the Rockwell International Chair in aeronautics and astronautics at MIT. Waitz is interested in high-speed propulsion and flight, in particular matters which relate to reducing the environmental impact of aircraft. He conducts his research in the Gas Turbine Lab. . . . **Mark Drela**, '82, SM '83, PhD '86, a principal designer of the human-powered Daedalus aircraft which set world's distance and endurance records, has been appointed the first holder of the T. Wilson Professorship in Aeronautics. The career development chair was established by a grant from the Boeing Co. in Seattle. T. A. Wilson, SM '53 (XV), is a former president and chair of Boeing. Drela will hold the chair for a two-year term that ends in December 1992. Con-

sidered one of the world's leading experts on human-powered flight, Drela is also well known for his contributions to computational fluid dynamics.

Alan M. Edwards, SM '61, of Crownsville, Md., died on February 11, 1992. Edwards was a retired Air Force officer who flew 264 missions as the pilot of an F-100 fighter-bomber in the Vietnam War and later became a member of the Air Force Scientific Advisory Board. In the course of his Air Force career, Edwards served at various bases in this country, including the Air Force Academy. He was military assistant for international programs in the Office of the Secretary of Defense when he retired in 1975 with the rank of lieutenant colonel. His military decorations included two awards of the Distinguished Flying Cross, the Bronze Star, and eight awards of the Air Medal. When he left the Air Force, Edwards joined the Washington office of Figgie International, Inc. In 1987, he started Edwards Associates, a consulting marketing firm for electronics and digital imaging companies. Edwards was a member of several organizations including the Air Force Association

XVII POLITICAL SCIENCES

Arthur B. Corte, SM '75, writes: "I have been appointed by the governor to the Telecommunications Study Committee, developing a state-of-the-art data network for the State of New Hampshire." . . . **Anne H. Cahn**, PhD '71, is a senior MacArthur Scholar at the Center for International Security Studies at the University of Maryland in Bethesda.

XVIII MATHEMATICS

Edward H. Kaplan, SM '79, MCP '79, PhD '84 (XI), SM '82, writes: "I received the Connecticut AIDS Leadership Award from the Commissioner of Health Services for evaluating the New Haven needle exchange program, and for developing mathematical models of the AIDS epidemic." . . .

Robert H. Scanlan, PhD '43, sends word: "I am a professor of civil engineering and a principal research scientist at Johns Hopkins University in Baltimore since my retirement from Princeton University, where I have been emeritus professor since 1984. I have been a member of the National Academy of Engineering since 1987."

Arthur P. Mattuck, Course XVIII professor, has been named a MacVicar Faculty Fellow. He is one



A.P. Mattuck

of six professors recognized for their "exemplary and sustained contributions" to undergraduate education under a new program named for the late Margaret L.A. MacVicar, '64 (VIII), ScD '67 (III), the first dean of undergraduate education. Faculty members are appointed for 10-year terms and receive \$5,000 each year in discretionary funds for support of educational activities, research, travel, and other scholarly expenses. Exxon Educational Foundation has given a \$1-million gift and MIT has committed \$10 million in endowment to the program. "A teacher with a personal style that is inimitable, unforgettable, and inspirational" . . . "When he speaks to calculus students, you have the feeling that he was up until three the night before working on the problem set with them; how else could he understand so completely what needed to be explained?"

were comments submitted to the provost about Mattuck. . . . **Harold Abelson**, PhD '73, Course VI professor, has also been named a MacVicar Faculty Fellow. "His course, now widely emulated in this country and elsewhere, has introduced several generations of computer scientists to a way of thinking that is a far cry from the usual pedagogy," was a comment submitted to the provost about Abelson.

Robert R. Reitano, PhD '76, reports: "My wife, Lisa, and I are happy to announce the birth of our twin sons, Michael and David, on August 8, 1991. . . . **Nevin Scrimshaw**, PhD '85, MIT Institute Professor Emeritus, director of the Food, Nutrition, and Development Program for United Nations University in Tokyo, and a member of the Harvard Center for Population Studies, has been selected as one of 24 Sesquicentennial Alumni at Ohio Wesleyan University. Scrimshaw has focused his career on stopping hunger and malnutrition in developing nations. He was cited by Ohio Wesleyan for "developing incaparina, an inexpensive protein supplement for children in developing countries to fight protein deficiencies." . . . **Dimitris J. Bertsimas**, SM '87, PhD '88, Course VI professor, is a recipient of an NSF Presidential Young Investigator Award. The award finances research by faculty members near the beginning of their careers. Bertsimas' field of study is operations research. . . . **Robert D. MacPherson**, Course XVIII professor, has been awarded the National Academy of Sciences Award in Mathematics. The \$5,000 prize is given every four years for excellence in research in the mathematical sciences published within the past 10 years

XX APPLIED BIOLOGICAL SCIENCES

Solo R. Kuvibidila, SM '77, PhD '80, writes: "I am presently an assistant professor of pediatrics and director of hematology/oncology." Next time Kuvibidila sends word, we hope he includes where he works. . . . **Rennée H. Sperber**, SM '75, PhD '77, has returned to Cambridge to open a private practice as L.I.C.S.W. specializing in eating disorders and bereavement counseling. . . . **Ronald V. DiPaolo**, PhD '72, has been named operations director at Boston Biomedica, Inc., in West Bridgewater, Mass. Previously he was VP at Collaborative Research, Inc., in Bedford, Mass.

Matthew S. Bryant, PhD '87, is working at the Chemical Industry Institute of Toxicology in Research Triangle Park, N.C. He joined CIIT in late 1990 after being an FDA staff fellow at the National Center for Toxicological Research in Jefferson, Ark. His research interests include the use of DNA and protein adducts as biomarkers of exposure and applications of analytical chemistry/mass spectrometry to toxicology. In the October 1991 issue of *CIIT Activities*, he was coauthor of "Hemoglobin Adducts as Dosimeters of Exposure to DNA-Reactive Chemicals." . . . **Charles I. Cooney**, SM '67, PhD '70, professor of chemical and biochemical engineering and associate director of the Biotechnology Process Engineering Center, and **Daniel I.C. Wang**, '59 (X), SM '61, the Chevron Professor of Chemical Engineering and director of the Biotechnology Process Engineering Center, were two of seven Course X faculty members elected founding Fellows of the American Institute for Medical and Biological Engineering in recognition of their significant contributions to their field. The AIMBE was established with the help of funding from the NSF, to develop a new organization that would unify the medical and biological engineering community in the United States.

XXI HUMANITIES

Peter C. Perdue, Course XXI associate professor and head of the History faculty, has been awarded the 1992 Levitan Prize in the Humanities. The \$20,000 prize was established through a gift from James A. Levitan, '45 (X), a member of the MIT Corporation and a senior partner in the law firm of Skadden, Arps, Slate, Meagher, and Flom of New York City. The prize, first awarded in 1990, supports innovative and creative scholarship in the humanities by faculty members in the School of Humanities and Social Science. Perdue, a leading specialist in modern Chinese history, will use the prize to continue research into the Chinese conquest of Central Asia from 1680-1760. . . .

Irene R. Heim, has been appointed to the Class of 1943 Career Development Chair in linguistics and philosophy. Heim is recognized as one of the most prominent and most influential figures in contemporary semantics, an area that is among the most technically complex branches of linguistics. As a teacher, Heim is noted for her ability to introduce her students to the strands of semantic argument and then showing them how these are woven into the broader picture of the field. In her publications and colloquium and conference presentation, she has been a force for reshaping the field of semantics and is seen as a leading voice affecting the choice of the central questions to be asked and their answers as well.

Douglas J. Forsyth, has been appointed to the Class of 1922 Career Development Chair in history. Forsyth is noted for his research on the political economy of 20th century Europe and for his innovative teaching. He is the author of the forthcoming *Monetary and Financial Policy and the Crisis of Liberal Italy*, which examines the political economy and the crisis of parliamentary government in Italy from 1914-22. . . . **Christopher D. Sawyer Laucanno**, lecturer in the Program in Writing and Humanistic Studies, has been awarded a \$10,000 Translators Fellowship Grant from the National Endowment for the Arts. The grant will support the translation from Spanish of *Sobre Los Angeles* (Concerning the Angels), a book of poems by Rafael Alberti. . . . **Catherine V. Chvany**, professor of Russian in the Foreign Languages and Literature Section at MIT, has received the Distinguished Scholarly Career Award from the American Association of Teachers of Slavic and East European Languages. The award, for outstanding contribution to scholarship, was presented at the group's 50th anniversary meeting in San Francisco. Chvany, an internationally known expert on the Russian language and linguistics, is coordinator for MIT's interdisciplinary program in Russian studies. She came to MIT in 1971 and was promoted to full professor in 1985.

The Association of Alumni and Alumnae has been notified that **Oswaldo A. Jaeggli**, PhD '80, of Los Angeles, died on August 20, 1990. Jaeggli had been a professor in the Linguistics Department at UCLA. There was no further information provided.

XXII NUCLEAR ENGINEERING

Robert W. Sawdye, SM '78, ScD '85, writes: "I am in a new position as principal consultant at Devon-rue, Ltd., in Boston. We have new family members due soon, twin girls to join 3-year-old son, Alex. Elaine and I are dreaming of a vacation, someday." . . . **Jacquelyn C. Yanch** has been appointed to the W. M. Keck Career Development Chair in nuclear engineering/Whitaker College. Yanch is a Course XXII assistant professor with a secondary appointment at the Whitaker College of Health Sciences and Technology. Her research currently involves investigation of the uses of ionizing radiation in medicine for both diagnostic

and therapeutic purposes, and the understanding of the health effects of ionizing radiation.

TPP TECHNOLOGY & POLICY, PROGRAM

Diana B. Dutton, SM '76, is the author of *Worse than the Disease: Pitfalls of Medical Progress* (Cambridge University Press, 1988). . . . **Hans Peter Brondmo**, SM '87, was featured in an article entitled "Ideas Galore, but Where Are the Goods" in the February 10, 1992 issue of *Business Week*. Brondmo is co-founder of DIVA in Cambridge, a Macintosh software developer spun off from the MIT Media Lab. . . . **Christoph Hilz**, SM '90, is currently on the staff in the Commission of the EC, DGI-PHARE in Belgium. His thesis for TPP, International Toxic Waste Trade, has been published by Van Nostrand Reinhold in New York and is being introduced to the market later this month.—R  n   Smith for Richard de Neufville, Technology and Policy Program, MIT, Room E40-252, Cambridge, MA 02139

STS PROGRAM IN SCIENCE, TECHNOLOGY & SOCIETY

Professor **Leo Marx** was the keynote speaker at a March conference on Nature and Arts in the Humanities sponsored by the Maine Alliance for Arts Education in Portland, Maine. His essay, "The American Ideology of Space," available as STS Working Paper #8, has been published by the Museum of Modern Art. . . . Professor **Merritt Roe Smith** spoke at the Cornell University STS Program in March. His topic was "Technology, Industrialization, and Social Change in 19th Century America." He also commented on two papers at a March conference on "The Transformation of the New England Landscape" at Old Sturbridge Village. . . . Professor **Sherry Turkle** delivered the keynote address, "Computation and Psychology," for the Educational Telecommunications Conference on New Strategies in Distance Learning. The conference was held in Lexington, Mass., at the end of February. . . . **Brian O'Donnell** gave the Hayes Seminar at St. Joseph's University in Philadelphia in February. His paper was entitled "Industrialization and Deindustrialization in the Merrimack Valley."

Deceased

The following deaths have been reported to the Alumni/ae Association since the *Review* last went to press:

Caruthers A. Coleman, '16; February 5, 1992; Lexington, Ky.
Elizabeth G. Pattee, '16; March, 1991; Hightstown, N.J.
Richard F. Lyon, '20; 1991; Laguna Hills, Calif.
Samuel Schenberg, '20; April 23, 1991; Miami, Fla.
Clifton B. Morse, '22; November 4, 1990; Carmel Valley, Calif.
Atherton Hastings, '23; February 8, 1992; Florence, Ala.
Laurence S. McLane, '23; November, 1990; Poway, Calif.
George B. McReynolds, '23; 1991; Montecito, Calif.
Clifford P. Swaine, '23; February 6, 1992; South Hamilton, Mass.
Edward A. Abdun-Nur, '24; October 3, 1991; Denver, Colo.
Carleton Shugg, '24; January 23, 1992
Hubert D. Barnes, '25; January 2, 1992; Milwaukee, Wis.
Leslie B. Bragg, '25; February 24, 1992; Skaneateles, N.Y.

Ray E. Lucey, '25; February 3, 1992; Fort Lauderdale, Fla.
Samuel B. Maddock, '25; 1991; Portsmouth, N.H.
Philip S. Mancini, '26; January 29, 1992; Beverly Hills, Fla.
Donald S. Nelson, '26; January 4, 1992; Dallas, Texas
Francis H. Whitaker, '26; February 9, 1992; Wayne, Pa.
Stanley C. Boyle, '27; January 29, 1992; Terre Haute, Ind.
Paul E. Parker, '27; August 5, 1991; Fair Oaks, Calif.
Alden G. Reed, '27; December 29, 1991; Woodburn, Ore.
John H. Wever, '27; February 24, 1992
Hector E. Hagerdorn, '28; April 10, 1991; Madrid, Spain
Henry F. Kohler, '28; January 21, 1992; Alexandria, Va.
William H. Phillips, '28; 1990; Albany, N.Y.
Floyd W. Buck, '29; January 15, 1992; Hamden, Conn.
Harry F. Dickinson, '29; September 20, 1991; Rotunda West, Fla.
John T. Hallahan, '29; February 25, 1992; New York, N.Y.
Francis S.F. Leong, '30; 1988; Honolulu, Hawaii
Milton Mezzoff, '30; February 25, 1992; Providence, R.I.
Robert G. Marcus, '31; January 16, 1992; Princeton, N.J.
Doyle L. Northrup, '31; December 15, 1991; Satellite Beach, Fla.
Samuel B. Pritchard, '31; 1991; Saint Petersburg, Fla.
Arthur C. Sugden, '31; 1991; Tuxedo Park, N.Y.
Charles M. Davis, '32; 1991
Robert B. Freeman, '32; February 21, 1992; Kentfield, Calif.
Rene G. Hochreutiner, '32; November 12, 1991; Vaud, Switzerland
Herbert J. Pfingstag, '32; June 11, 1983
Philip W. Snyder, '32; 1990
Jack F. Andrews, '33; December 29, 1991; Lawrenceville, N.J.
James M. Dunlap, '33; December 30, 1991; St. Louis, Mo.
Warren G. Webster, '33; March 3, 1992; Lexington, Mass.
Radcliffe G. Edmonds, '34; June 30, 1991; Canaan, N.H.
Edward L. Wemple, '34; February 27, 1992; Darien, Conn.
George A. Revell, '35; 1991; Cornwall, Ontario
Kenneth B. Gair, '37; January 17, 1992; Alamo, Calif.
James W. Pearce, '37; January 18, 1992; Cincinnati, Ohio
Gerald L. Simard, '37; January 30, 1992; Winterport, Maine
William C. Wulbern, '37; September 17, 1990; Charleston, S.C.
Gordon L. Foote, '38; October 24, 1991; Columbus, N.C.
Marvin M. Kahn, '38; April 27, 1990; Sharon, Mass.
J. William Blattenberger, '40; January 26, 1992; Lawrenceville, N.J.
James E. Fifield, '40; January 23, 1992; Darien, Conn.
Kenneth R. Fox, '40; February 22, 1992; Rockport, Mass.
Thomas P. McConville, '40; June, 1990; Santa Maria, Calif.
Karr Parker, Jr., '41; August 3, 1991; Buffalo, N.Y.
William H. Reeder, 3rd, '41; 1991; Warren, N.J.
Giulio Ascoli, '42; February 4, 1992; Urbana, Ill.
Charles S. Hofmann, '42; January 31, 1992; West Yarmouth, Mass.
Willard D. Nalchajian, '42; February 10, 1992; Chelsea, Mass.
Maynard S. Renner, '42; December 31, 1991; Groton, Mass.

Alessandro Morelli, '44; November 18, 1991; Cohasset, Mass.
 Paoli E.C. Massaglia, '45; January 14, 1992; Stuart, Fla.
 Theodore E. Gerber, '46; February 7, 1992; Guilford, Conn.
 Emerson H. Newton, '46; March 14, 1992; Arlington, Mass.
 Norman I. Gold, '47; March 5, 1987; Newton Highlands, Mass.
 Thomas K. Hughes, '47; April 10, 1991; Dickinson, Tex.
 William M. Hunt, '47; January 15, 1992; Lambertville, N.J.
 Robert L. Kamm, '47; January 27, 1992; Birmingham, Mich.
 Vance A. Myers, '47; February 9, 1992; Fairfax, Va.
 James P. Storm, '47; 1991; Menlo Park, Calif.
 Donald S. Floyd, '48; May 2, 1991; Alexandria, Va.
 William Nicholson, '48; 1992; Easton, Md.
 Edward T. Podufaly, '48; January 20, 1992; Sherwood, Md.
 Roger L. Sisson, '48; January 22, 1992; Lafayette Hill, Pa.
 Edward N. Strait, Jr., '48; November 12, 1991; St. Paul, Minn.
 William S. Hutchinson, Jr., '49; February 2, 1992; Jacksonville, Fla.
 Willem E. Lower, '49; 1990; Holton, The Netherlands
 Ferdinand G. Mikel, '49; March 3, 1992; Silver Spring, Md.
 Chien-Hou Chang, '50; January 14, 1991; Tianjin, China
 Theodore S. Huang, Jr., '50; November 2, 1991; Alexandria, Va.
 Charles W. Ellis, 3rd, '51; January 25, 1992; Newt Square, Pa.
 Matthew Goodwin, '52; July 26, 1990; Culver City, Calif.
 Roger E. Ladd, '52; January 9, 1992; Manchester, Mass.
 Malcolm C. McQuarrie, '52; January 3, 1992; Oakland, Calif.
 Gabriel Palmero, '52; 1991; Washingtonville, N.Y.
 Francis B. Van Wyk, '52; 1991; Wallingford, Pa.
 Morris B. Carter, '53; November 29, 1991; Columbia, Tenn.
 William T. Wootton, '53; June 1, 1991; Santee, Calif.
 Richard F. Merrill, '56; February 17, 1992; Baltimore, Md.
 Harold H. Rothstein, '56; 1991
 Lester Y. Sen, '56; 1991
 Robert K. Boese, '57; August 6, 1991; Glen Cove, N.Y.
 Lovett R. Smith, Jr., '57; April 17, 1991; Danbury, Conn.
 Rene E. Unson, '57; February, 1991; Manadalu-yong, Philippines
 Edwin R. Rose, '58; January 1, 1992; Houston, Tex.
 Gabriel T. Kerekes, '60; 1991
 Alan M. Edwards, '61; February 11, 1992; Crownsville, Md.
 Keihachiro Moriyasu, '62; January 4, 1992; Her-miston, Ore.
 Albert O. Riordan, Jr., '62; January 23, 1992; Hor-nell, N.Y.
 Leonard H. Edwards, '64; March 26, 1991; Cincin-nati, Ohio
 Freeman K. Keyte, '66; February 19, 1992; Nepean, Ontario
 Willard J. Basner, Jr., '69; January 24, 1992; Franklin, Mass.
 Edward A. Parks, '69; 1991; Big Flats, N.Y.
 Richard E. Brackeen, '75; February 5, 1992; Great Falls, Va.
 Osvaldo A. Jaeggli, '80; August 20, 1990
 Michael H. Bulat, '81; 1985
 Clinton C. Bourdon, '83; February 2, 1992; Ipswich, Mass.

PUZZLE CORNER

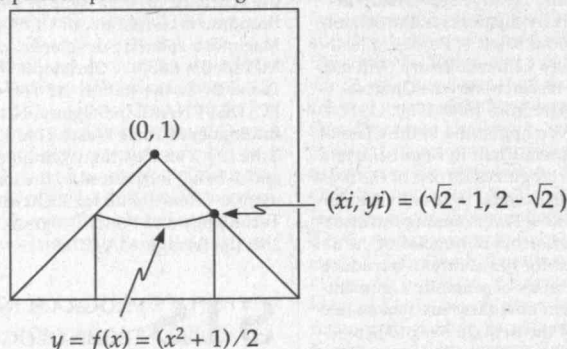
Continued from Page MIT 47

being hit, what is the probability that the dart will land nearer to the center of the board than it does to an edge.

George Blondin characterizes the solution

$$(4\sqrt{2}-5)/3$$

as "a really neat answer." Blondin writes: For a 2 by 2 square with center at (0,1), equating the squared distance from the center, $x^2+(1-y)^2$, to the squared distance from the bottom edge y^2 gives a parabola: $y=(x^2+1)/2$ which intersects the lower right diagonal ($y=1-x$) at X_i, Y_i where $X_i=\sqrt{2}-1, Y_i=2-\sqrt{2}$. The area nearer the edge in this quarter square (whose gross area is 1.0) is the area under this parabola plus the two triangles with sides = Y_i .



Integrating $\int y \cdot dx$ gives $(x^3+3x)/6$. Evaluating between $-X_i$ and $+X_i$ then adding $Y_i/2$ for the triangles gives $(8-4\sqrt{2})/3$ as the chance of hitting nearer the edge. $1-(8-4\sqrt{2})/3=(4\sqrt{2}-5)/3$ is the chance of hitting nearer the center.

F/M 3. Our last problem is from my NYU Colleague, Dennis Shasha, and can be found in his book, *The Puzzling Adventures of Dr. Ecco*.

You are given 20 coins. Some are fake and some are real. If a coin is real, it weighs between 11 and 11.1 grams. If it is fake, it weighs between 10.6 and 10.7 grams. You are allowed 15 weighings on a scale (not a balance). You are to determine which coins are real and which are fake.

Our last solution is from Edgar Rose:

1. Divide the coins into five groups of four. We must determine, in three weighings or less, the nature of each coin in a given quartet.

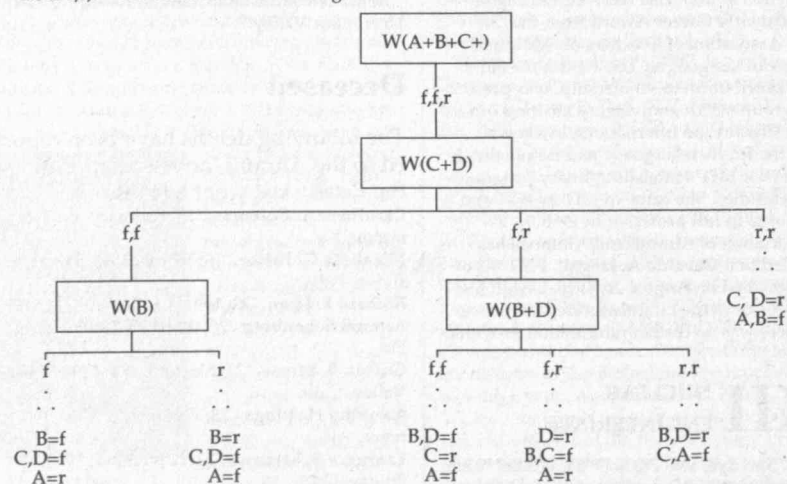
Let's take one group of four and mark the coins A, B, C, and D respectively. Also we will use "f" and "r" when referring to fakes and real coins. As the last preparatory step, we set up a table of weight ranges for the three possible pairs (f,f; f,r; and r,r) and the four possible trios (f,f,f; f,f,r; f,r,r; and r,r,r); i.e., $W(f,f) = 21.2-21.4$ grams, $W(f,r) = 21.6-21.8$ grams, etc. There are no overlaps between the ranges, therefore each weighing will identify how many f's and r's there are in the weighed group.

2. Weigh A+B+C

2.1 If f,f,f or r,r,r—weigh D for identification.

2.2 If f,f,r—use chart below.

2.3 If f,r,r—use chart below but change all "r's" in the chart to "f's," and vice versa.



Other Responders

Responses have also been received from J. Abbott, J. Bitsky, C. Brooks, F. Carbin, W. Cluett, N. Cook, D. Detlefs, D. Eckhardt, S. Feldman, E. Field, E. Freudenthal, E. Friedman, J. Grossman, B. Huntington, J. Landau, M. Lindenberg, E. Lund, D. McMahon, G. Parks, R. Record, S. Root, K. Rosato, J. Rudy, E. Sard, L. Saunders, C. Taubman, D. VanPatter, W. Woods, H. Zaremba.

Proposer's Solution to Speed Problem

Sand box, tricycle, backwards glance, life after death, see-through blouse, he's beside himself over her, GI overseas, 3 degrees below zero.

Dot's Entertainment

It has been a year since I reviewed the criteria used to select solutions for publication. Let me do so now.

As responses to problems arrive, they are simply put together in neat piles, with no regard to their date of arrival or postmark. When it is time for me to write the column in which solutions are to appear, I first weed out erroneous and illegible responses. For difficult problems, this may be enough; the most publishable solution becomes obvious. Usually, however, many responses still remain. I next try to select a solution that supplies an appropriate amount of detail and that includes a minimal number of characters that are hard to set in type. A particularly elegant solution is, of course, preferred as are contributions from correspondents whose solutions have not previously appeared. I also favor solutions that are neatly written, typed, or sent via e-mail, since these produce fewer typesetting errors.

Problems

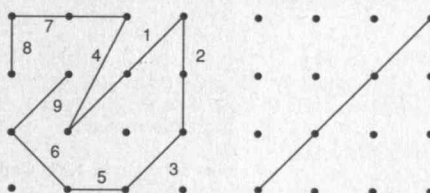
JUL 1. We begin with a bridge problem from Richard Hess, who (I guess) always seems to get low point count hands and likes to see how far they can go. Inspired by the 1991 Jan 1 problem, Hess asks for the lowest number of high card points that North and South can have (combined) and still make 7NT against best defense.

JUL 2. Matthew Fountain suggests we tackle the "hold that line" problem devised by Sid Sackson and appearing in his book *A Game of Games*.

"Hold That Line" is a game in which two players alternate drawing straight lines between dots on a 4 x 4 dot field. The player to draw the last line loses. The first diagram shows a game in which the lines are numbered in the order they were drawn. Restrictions are that lines after the first shall only be drawn from the free end of a previously drawn line. All lines must be straight and start and end at a dot. A line may

connect more than two dots if all are in a straight line. No line shall be drawn to a previously connected dot or cross another line.

The second diagram shows a game in progress where the first player has drawn his first line along a long diagonal of the field. Is this a winning or a losing move? There can be no ties.



GAME LOST BY FIRST PLAYER

GAME IN PROGRESS

JUL 3. Geoffrey Landis has found our previous cryptarithmic problems (where you are given an arithmetic equation such as $XXX + Y = YZZZ$ and must find which digits to assign to each letter, in this trivial case $X=9, Y=1, Z=0$) "rather uninteresting." So he offers a challenge. Find a cryptarithmic problem with (precisely) two solutions based on two (completely) different keys, i.e., no letter is assigned the same digit in both solutions. I would not be surprised to find that Nob. Yoshigahara has a few dozen of these sitting under his socks in his bureau.

Speed Department

Pete Chandler wants you to figure out each of these eight brain teasers.

SAND	Cycle Cycle Cycle	ECNALG	Death/Life
BL CO US E	He's/Himself Her	GI ccccccc cccccc cccccc cccc	0 MD PhD MA

Solutions

F/M 1. Dave Wachsman sent us a hand he played (as South) with his wife that was reported in Truscott's Column in The New York Times.

North	
♠	82
♥	A 72
♦	Q 75
♣	K Q 9 4 2
West	
♠	9 7 3
♥	J 8 6 5
♦	K J 10 3 2
♣	J
East	
♠	6 5
♥	10 4
♦	9 8 4
♣	A 10 8 6 5 3
South	
♠	A K Q J 10 4
♥	K Q 9 3
♦	A 6
♣	7

Both sides were vulnerable. The bidding:

South	West	North	East
1 ♠	Pass	2 ♣	Pass
3 ♠	Pass	3 N.T.	Pass
4 ♥	Pass	4 N.T.	Pass
6 ♠	Pass	Pass	Pass

How does Mr. Wachsman bring home the slam after West leads the club jack?

Larry Shiller sent us the following solution. If East lets club K win, declarer draws trumps and leads to dummy's diamond Q for 12th trick. Otherwise, declarer wins East's return in hand (ruffing high if a club), draws trumps, cashes diamond A, crosses to dummy with the heart A, and leads the club Q, discarding a diamond from the closed hand, squeezing West.

F/M 2. John Prussing believes that the following puzzle, which was actually on the 1989 Putnam exam, seems about right for Puzzle Corner.

A dart hits a square dartboard. If any two points on the dartboard have the same probability of

Continued on Page MIT 46



SEND PROBLEMS, SOLUTIONS, AND COMMENTS TO ALLAN J. GOTTLIEB, '67, THE COURANT INSTITUTE, NEW YORK UNIVERSITY, 251 MERCER ST., NEW YORK, N.Y. 10012, OR TO: GOTTLIEB@NYU.EDU

MIT LIFE INCOME FUNDS

MR. AND MRS. FLOYD A. LYON

HOME: Muttontown, New York

CAREER: Graduating during the war, Mr. Lyon, ME '42, joined the Air Armament Division of the Sperry Gyroscope Company—two of the 50 patents he holds are for gun sights he developed there. A week after the war ended, he and three colleagues left Sperry to form their own company, Halm Instruments, which made automatic assembly and fabrication machines. Over time, he bought out his partners and became president and chairman of Halm Industries Co., Inc., which now specializes in high-speed envelope printing and currency sequential numbering machines that are used all over the world. Halm also developed and manufactured solar-heating equipment and built a 100 percent solar-heated home on Long Island. Mr. Lyon is easing into retirement, and Halm Industries is now directed by his two sons and son-in-law.

Mr. and Mrs. Lyon enjoy fund-raising for various charities and sharing their hobbies of sailing, skiing and travel. This year, as chair of the Class of 1942 50th Reunion Gift Committee, Mr. Lyon led his class to a record-breaking 50th reunion gift, repeating his achievement of ten years ago, when he chaired his class's drive to a record-breaking 40th reunion gift. He was a member of the MIT Corporation and the Department of Mechanical Engineering Visiting Committee, and is co-chair of the Long Island Committee of the *Campaign for the future* and a member of the Corporation Development Committee. He received the Bronze Beaver in 1977 and the Dalton Bowl in 1982 for his service to MIT.

GIFTS OF CAPITAL: Floyd A. Lyon (1942) and Virginia T. Lyon Charitable Remainder Unitrust.

QUOTE: It's a pleasure giving to and working for MIT. I attribute my success in business to the skills in solving problems I learned at Tech.

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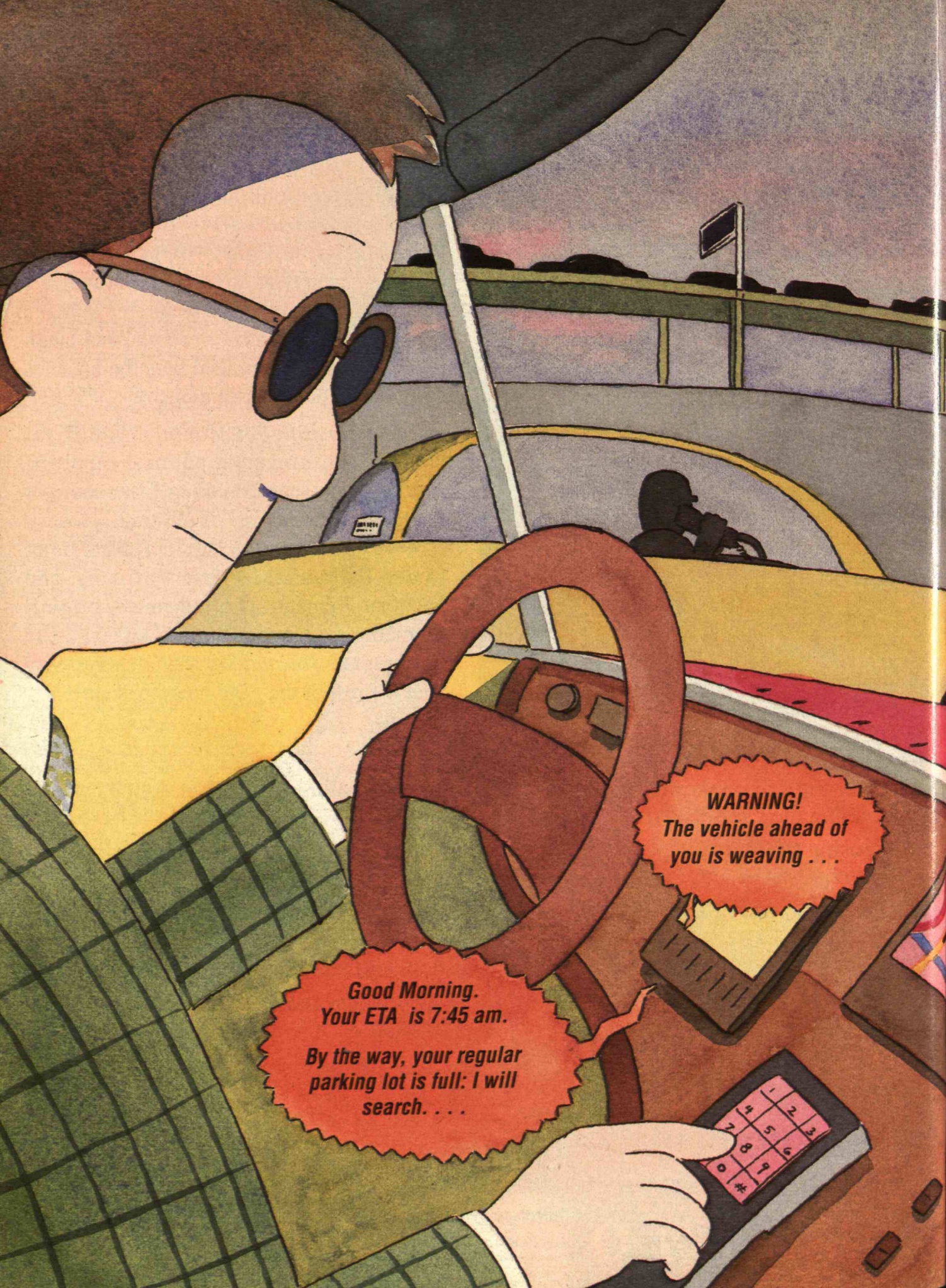
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THE CASE FOR SMART HIGHWAYS

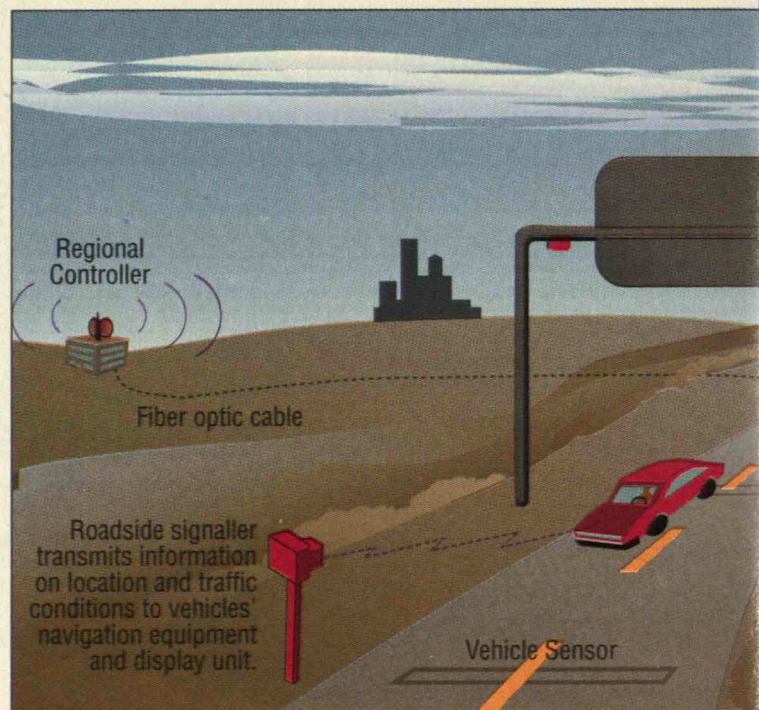
BY MOSHE BEN-AKIVA, DAVID BERNSTEIN, ANTHONY HOTZ, HARIS KOUTSOPOULOS, AND JOSEPH SUSSMAN

Fed up with traffic jams?

The high-tech highway should make auto travel safer, more efficient, and more pleasant.

Here, leading researchers answer some questions about the technology and why it is needed.

Sensors, computers, and communications would turn the roadway from passive infrastructure into a responsive, intelligent system. Vehicle sensors and video cameras would feed traffic information to computers at local and regional control centers, which would issue route advisories, synchronize lights, and control the displays on variable message signs. Cars could be charged for road use electronically, eliminating toll booth bottlenecks.



What would a “smart highway” do? The “intelligent vehicle highway system,” or IVHS, is a collection of technologies that would manage the flow of traffic in cities and on freeways to increase capacity, enhance safety, and ease congestion. A network of sensors would monitor the volume of traffic throughout the highway network. Computer control systems would respond rapidly to changing traffic conditions by, for example, adjusting the settings of traffic lights on major roads to alleviate traffic jams or to prevent tie-ups that the system anticipates.

The system would also deliver information to travelers about the status of the highway and public transit alternatives. Dashboard navigation aids would help drivers reach their destinations by the optimal path, given present and anticipated traffic conditions.

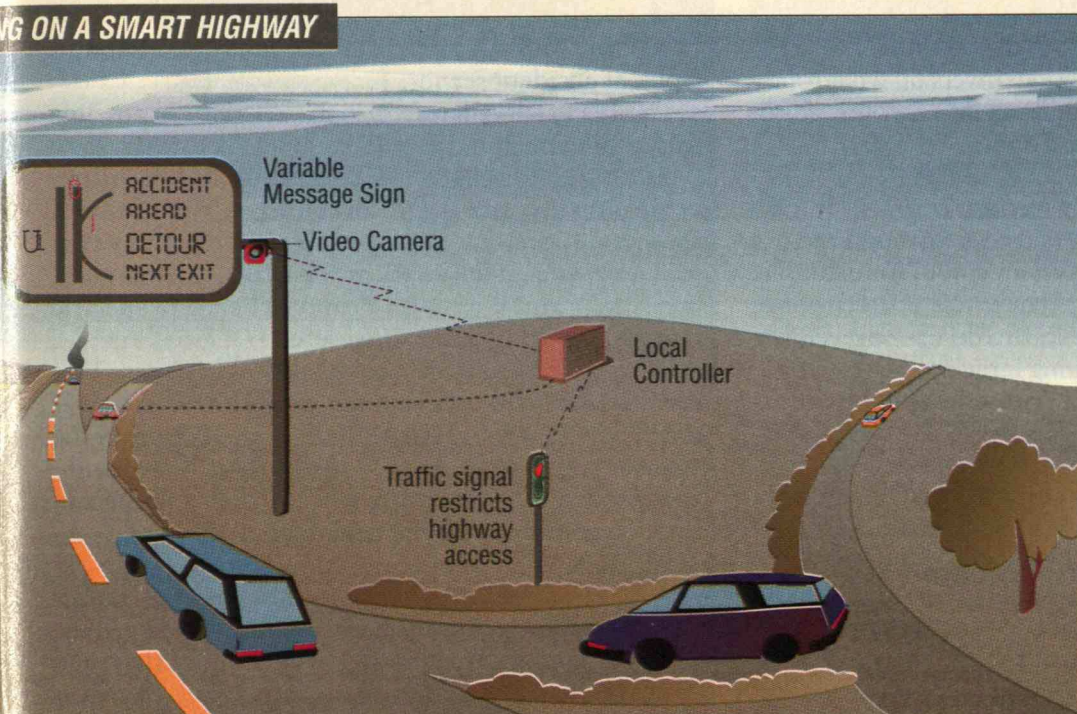
All five authors are associated with MIT. MOSHE BEN-AKIVA is professor of civil engineering and director of the Institute's IVHS research program. DAVID BERNSTEIN is an assistant professor of civil engineering, working on electronic toll collection and congestion pricing technologies. ANTHONY HOTZ is a control systems engineer at Lincoln Laboratory and executive director of the IVHS research program. HARIS KOUTSOPOULOS is an assistant professor of civil engineering, specializing in applications of information technologies to transportation problems. JOSEPH SUSSMAN is JR East Professor of Civil Engineering, currently on leave to work at IVHS America to help prepare its strategic plan.

Who's behind the IVHS idea? Much of the early impetus came from states, particularly California and Texas. In 1987, the Federal Highway Administration spearheaded a joint effort of government, industry, and academia—called Mobility 2000—that led in 1990 to a seminal document describing a vision for IVHS, and to the formation of an organization called the Intelligent Vehicle Highway Society of America, or IVHS America. This group is expected to deliver to the U.S. Department of Transportation this summer a strategic plan for putting intelligent highway technologies into place nationwide.

The prime vehicle (so to speak) for federal involvement in IVHS is the Intermodal Surface Transportation Efficiency Act (ISTEA). Signed by President Bush last December, ISTEA authorizes \$660 million over the next six years for IVHS, including R&D, operational tests, and deployment. Federal spending in fiscal 1992 will be \$234 million. A number of state and local governments are also sponsoring smart-highway projects. California, in fact, had an IVHS effort that preceded the present federal one. And in New York and New Jersey, an organization called Transcom is using new technologies to manage traffic in the New York City metropolitan area.

In addition to the work on IVHS at many universities and research labs, the private sector is also investing in the technology. General Motors, for example, is furnish-

ING ON A SMART HIGHWAY



ing 100 automobiles—each fully equipped with such IVHS features as a navigation system and travel-information computer—for the Travtek field test in Orlando. And Motorola has produced similar in-vehicle gear for the few thousand cars that will participate in the Advance program in Illinois.

What are other countries doing? Europe has several substantial programs. The biggest is called PROMETHEUS (Program for European Traffic with Highest Efficiency and Unprecedented Safety). PROMETHEUS is an \$800 million, eight-year project (1986-94) focusing primarily on new vehicular technologies such as collision avoidance systems and on-board navigation systems.

The second major European program is called Dedicated Road Infrastructure for Vehicle Safety in Europe, or DRIVE. From 1988-91, DRIVE spent \$170 million developing the basic technologies required for an intelligent highway system. Now, in its second phase, DRIVE is devoting some \$240 million to verifying that the technologies work. In some of the DRIVE pilot projects, an electronic system is controlling access to freeways at entrance ramps, in-vehicle equipment is helping drivers pick the best route to their destination, and traffic control and information systems are managing traffic throughout large portions of metropolitan areas.

Japan is active as well. The country recently began a program called VICS (Vehicle Information and Communication Systems) to better integrate and focus its efforts in smart-highway technology. In fact, commercialization of some IVHS technologies has already begun in Japan: about 200,000 vehicles are already equipped with navigation systems.

What's the urgency for intelligent highways? Since 1983, U.S. automobile traffic has been growing by about 4 percent a year to its current annual level of more than 2 trillion vehicle-miles. Some projections indicate a doubling to 4 trillion vehicle-miles by 2020. Without substantial improvements in the highway system, congestion delays will increase by 400 percent, according to the Federal Highway Administration.

But is having to sit a few minutes in traffic anything more than a minor nuisance? Yes. The loss of U.S. productivity due to traffic congestion is estimated at \$100 billion annually, according to IVHS America. Such a huge waste threatens the nation's ability to compete economically.

Would the intelligent highway take control of the car? It wouldn't have to. For the near term, at least, drivers would still operate their car's accelerator,

brake, and steering wheel, just as they do now. The IVHS would manage traffic by advising drivers on what routes to take to avoid congestion, taking into account up-to-the-minute data on traffic conditions.

How would the IVHS reroute traffic? In two principal ways. One is direct, through the use of traffic lights. The IVHS system could, for example, restrict the volume of traffic that enters at an entrance ramp just "upstream" of a traffic tie-up—preventing small problems from becoming large ones.

Another way would be by providing timely information to drivers about where tie-ups are. Programmable highway signs might urge drivers to take alternate routes to avoid congestion. The system could also broadcast traffic information directly to in-vehicle displays, which would show drivers graphically where the trouble spots are or provide spoken route directives. Presumably, drivers would respond to these advisories and avoid the "hot spots," to everyone's benefit.

We already have radio traffic reports. Why would this be any better? Radio stations have less than one minute to describe the traffic picture for an entire metropolitan area. There is no way such a broadcast can cover every traffic tie-up. Also, the radio can report traffic problems only after they occur. A smart highway system could go one step further, by anticipating trouble spots and actively taking steps to prevent them.

In our vision of IVHS, the systems that provide traffic information to drivers would be integrated with those that directly control the flow of vehicles. Both systems would share the same information from the same network of sensors. This is crucial, because the information that drivers receive influences their driving behavior. For example, if the IVHS encourages drivers to avoid a main thoroughfare because of an accident, it ought to be smart enough to anticipate a higher number of vehicles on the principal alternative routes—and to synchronize the traffic signals accordingly.

How would the system know what traffic flow to expect? It would use computer models, which would draw partly on historical data—what volume of traffic has been observed at a given point under given conditions—and partly on algorithms that predict traffic volume based on factors such as the weather, the time of day, and the number of cars that have entered at particular access ramps. The models would also take into account typical driver

behavior, such as the tendency to slow down and gawk at accident scenes.

The IVHS surveillance system will make it possible to compile much more reliable models of traffic flow than now exists. Because it continuously monitors vehicle traffic, the IVHS can build a database with specific information on, for example, how many cars tend to take a given route at a particular time—say, between 8 and 9 a.m. on Friday. The more specific this information is, the more useful.

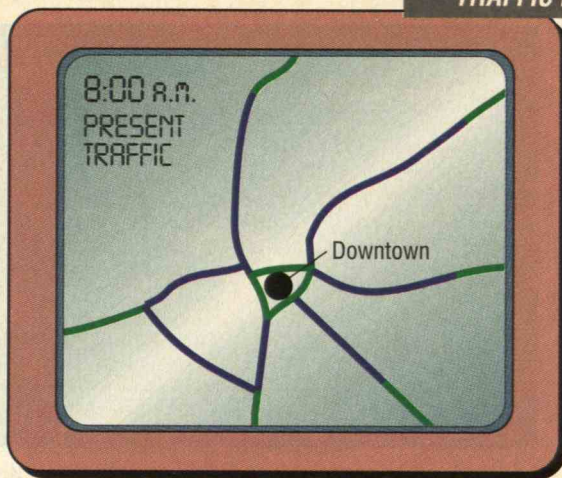
Ultimately, the system would also use the data that drivers enter into their vehicle navigation systems. If the IVHS knew the destinations of a great many of the vehicles on the road, it could make much more intelligent predictions as to where tie-ups might occur and could take measures to prevent them.

How would the smart highway monitor traffic? For the near term, common sensors will include inductive loops buried just below the road surface and ultrasonic sensors mounted overhead. These devices will count the vehicles passing a certain point and gauge their speed. As an alternative, image-processing computers could extract traffic data from video pictures. Although the latter systems are sensitive to weather and roadside environment, extensive tests in Minnesota over the past few years have provided promising results, with accuracy similar to that provided by inductive loop detectors. In the longer term, transmitters in vehicles might communicate directly to the IVHS surveillance computer, reporting the vehicle's location, speed, and type. If the vehicle also had a navigation system, it could include information on the driver's intended destination.

How would the system handle problems on the road, such as accidents and breakdowns? This is a key point, because half of overall traffic delay is due to accidents and disabled vehicles. One way to quickly detect a problem is to compare the traffic observed by the various roadway sensors with the traffic expected. When differences between the observed and predicted traffic exceed a predetermined threshold, the system deduces that something is amiss.

To verify that an accident or breakdown has indeed occurred, the IVHS could use strategically located video cameras that could be repositioned from an operator console. The system could also broadcast a query to cellular telephones in all vehicles that are detected to be in the vicinity of the presumed problem; at least some of these drivers, it is hoped, would respond by reporting their observations. In any case, once an incident has been verified, the system can dispatch emergency vehicles to the scene, informing the

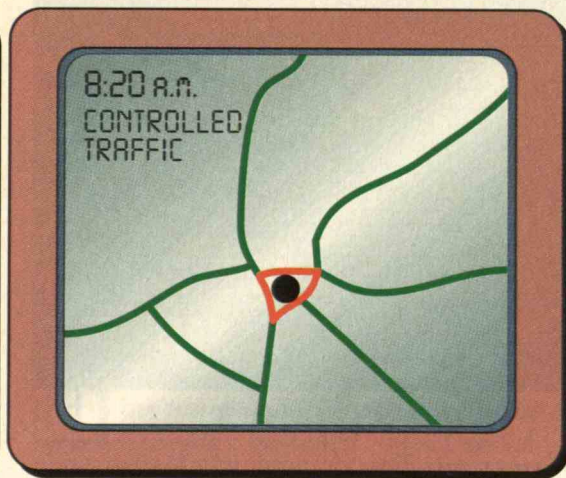
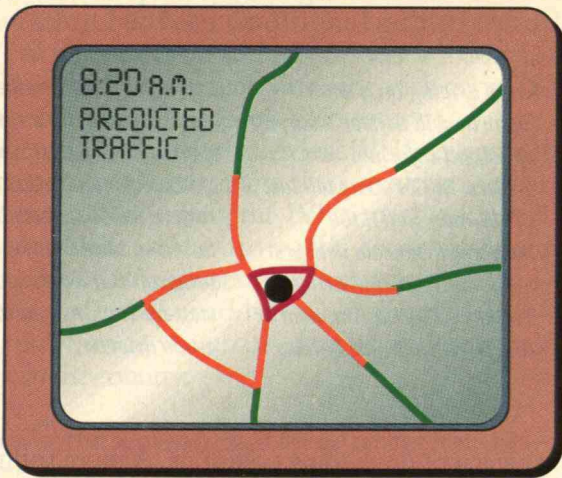
TRAFFIC PREDICTION



A smart highway would anticipate congestion. Here, roadway sensors provide a snapshot of present traffic (8:00 a.m.) in a metro-politan area. Computer models predict that in the absence of intervention, vehicles would converge during the

next 20 minutes and cause a traffic jam. To prevent this, the system synchronizes traffic lights, restricts access to problem highways, and instructs drivers to use alternate routes. As a result, the roadways at 8:20 are free-moving.

- Light Traffic
- Moderate traffic – no delays
- Heavy traffic – slow but moving
- Jammed



drivers of the best route to the problem site given present traffic conditions.

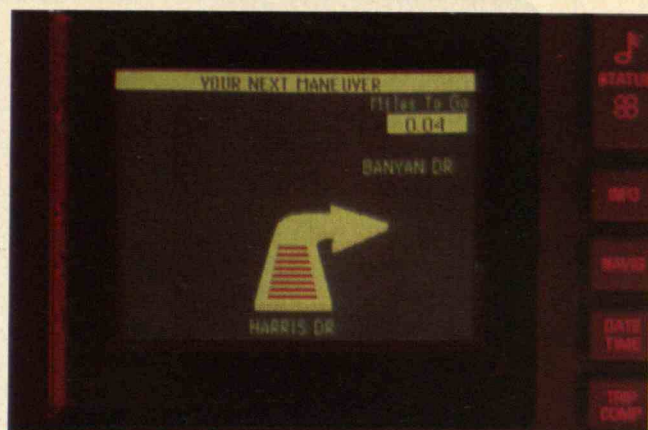
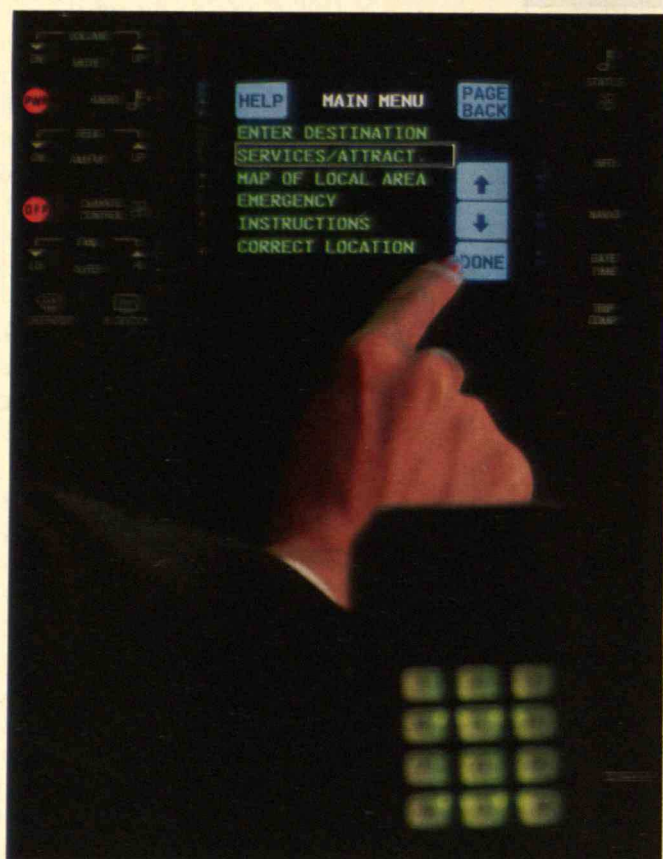
How would IVHS handle toll collection, which also tends to be a traffic choke point? In one scheme, drivers would buy and then attach to their windshield an electronically encoded tag that would allow them to drive at normal speed through the toll station. Electronic readers mounted overhead or buried in the roadway would transmit a radio signal to passing cars, debiting the tag or recording the identification of the tag for monthly billing. Such systems are already in place on the North Dallas Tollway, the Oklahoma Turnpike, and in Louisiana.

Could smart highways lead to charging for roads that are now “free?” That’s one way of relieving congestion. Some have proposed that drivers be charged a premium for driving at rush hour and given a discount—or even a rebate—for using the road at off-peak times. The basic idea is familiar; long-distance telephone companies and some electric utilities have long had similar pricing schemes.

Congestion pricing policies are being pursued throughout the world, particularly in densely populated areas. Singapore, for example, instituted it in 1975. Hong Kong tested a program between 1983 and 1985 and may now implement it full scale. Britain, Holland, Norway, and Sweden are actively developing congestion pricing as well. In the United States, congestion pricing has been viewed as politically unacceptable because of equity concerns. During the 1970s, the cities of Madison, Berkeley, and Honolulu all considered—and rejected—such policies. With changing technology and growing levels of traffic congestion, U.S. interest has picked up in the last few years. Both San Francisco and Portland, Ore., are now considering the idea.

It’s worth remembering that no roads are now “free.” The cost is merely hidden in the gasoline tax. One way to make congestion pricing politically more palatable would be to couple it with a reduction in the gas tax.

How would IVHS help drivers find their way around? Say you wanted to drive to an unfamiliar part of town. Before embarking on your trip, you would enter into your car’s computer where you are and



Cars driving on a smart highway will deliver a variety of helpful information to drivers. In GM's Travtek test in Orlando (left), the dashboard console delivers audio and video instructions on the car's location, nearby tourist attractions, hotels,

and restaurants, as well as the estimated drive time to their intended destination. Motorola's navigation system (above), now being tested in the Advance program in Illinois, delivers step-by-step instructions to guide drivers.

where you want to go. The computer would then guide you to your destination, alerting you when to turn.

How would the car "know" where it is? On-board sensors would keep track of all the vehicle's turns and accelerations; from this information, along with a comprehensive database of maps, the system would compute your location. Another method would require communication between the car and the highway system. Stoplights and highway signs, for example, could emit infrared signals that inform passing vehicles of their present whereabouts. Finally, trucking companies and fleet operators could use satellites to determine precise locations of a large number of vehicles.

Don't old-fashioned maps suffice? Sometimes—perhaps on a Sunday morning, when traffic is light. But IVHS can select the optimal route, which might vary depending on traffic conditions. A map can't do that.

Would a smart highway also be a safer highway? It should be. Improving the flow of traffic and providing routing information would lower driver frustration and irritation, which are at the root of many accidents. Also, vehicles could be equipped with radar

to warn of impending collisions. A more sophisticated system might not merely issue a warning but actually take momentary control of the vehicle, steering or braking to avoid a crash. As a side benefit of making the roads safer, IVHS would also raise highway capacity, because vehicles could travel closer to one another without substantially increasing the risk of accident.

Cars will clearly need new equipment to take advantage of smart highways' features. What evidence is there that consumers will pay for it? Some people will be motivated by concern for the greater good of society, such as the notion that IVHS will lessen air pollution and preserve land that otherwise would have to be paved for more highways. Most consumers, however, will pay only for what they perceive as tangible personal advantages, such as shorter commutes and improved safety. How much they will be willing to pay remains open to question; no publicly available market studies exist. Some in the auto industry contend that government-mandated air quality and fuel efficiency hardware will, by significantly raising the basic cost of cars, suppress the market for luxury options. But we expect that IVHS, with its direct economic benefits, would have a more robust appeal than less functional luxuries, such as leather seats.

One indicator of the potential market may be seen

**The
United States
will probably spend
more than \$200
billion during the
next 20 years
on IVHS.**

in Japan, where in-vehicle navigation systems are being sold as part of a \$3,000 package of luxury options. Japanese consumers are buying 12,000 of these units a month.

How will a driver be sure that IVHS gear bought in Chicago, say, will work when the car is driven to New York? This is a key issue; it goes to the question of national standards, which will depend upon a high degree of cooperation between traditional public-sector providers of infrastructure and private-sector manufacturers of in-vehicle equipment. Ensuring such cooperation is one of the key purposes of IVHS America.

Ideally, automobile companies and IVHS equipment manufacturers will subordinate their rivalries to their common interest in getting the IVHS market started. The development of the air-traffic control system stands as proof that such standards can emerge. Similar issues are also being addressed in the market for cellular telephones, which need to be able to work anywhere in the country.

Because the system would know where cars are—and, by inference, where their owners are—at least some of the time, doesn't that represent a threat to individual privacy? Certainly. Although some barriers can be erected to casual use of personal travel data, such safeguards are not perfect; if the information exists, someone can get at it.

Some IVHS systems may be designed to mitigate their potential invasion of privacy. For example, toll collection may be performed using prepaid electronic debit cards that eliminate the need to record the identity of individual vehicles. Another example is a dynamic routing system that does not require information from the vehicle about its desired destination. The system could, for instance, transmit to all vehicles at a particular intersection directions for getting to a large number of destinations. The in-vehicle navigation system, which would "know" where the driver was headed, would display only the relevant information. This way, the central IVHS computer need never find out where individual drivers are going. In fact, most IVHS technologies depend more on aggregate information—such as the total volume of traffic at a particular intersection—than on data about an individual's travel patterns.

IVHS is hardly the only technology that threatens privacy, of course. Enormous amounts of data about our personal lives are stored in various information repositories, maintained by both business and government.

Clearly, society needs to address this problem in all its manifestations, including IVHS. A major reworking of the Electronic Communications Privacy Act of 1986 is now being considered. In updating this legislation, Congress must pay heed to IVHS and its privacy implications.

IVHS will require a sizable investment from the U.S. automobile industry. Given its dismal financial performance of late—the Big Three lost \$7.8 billion in 1991—can we really expect automakers to carry this technology forward? There is no question that the auto companies are interested. The industry has been active in IVHS America and in helping to formulate the U.S. strategic plan for IVHS. But even without their participation, an after-market will develop for in-vehicle equipment. Also, overseas automakers and equipment suppliers are prepared to fill the gap should U.S. companies stay on the sidelines.

How much will it cost to develop an intelligent-highway system? The United States will probably spend more than \$200 billion during the next 20 years on IVHS, according to the plan developed by IVHS America. Government spending on R&D, testing, and purchase of IVHS infrastructure will account for 15–20 percent of that total. The rest will come from consumer purchases of in-vehicle equipment such as navigation consoles and collision-avoidance systems.

Wouldn't society gain at least as much by putting \$200 billion into a massive upgrade of the country's public transportation systems instead of into IVHS? Remember, only a fraction of that \$200 billion will be government spending. The lion's share will be in outlays by consumers and fleet operators—and this is not readily convertible into investment in public transportation. While there could be significant benefits from investments in public transportation, the reality is that Americans are too committed to automobiles to expect massive shifts away from the car. Also, IVHS is not incompatible with public transportation. The system might, for example, use programmable highway signs that encourage drivers to get off a congested highway at a particular exit where there is a park-and-ride train station, or provide transit conditions and schedules to computer terminals in the home or

**IVHS
is a perfect
opportunity
for collaboration
among
government,
business,
and academia.**

workplace. Some forms of public or semipublic transit—buses, car pools, and van pools—would directly benefit from the reduced highway congestion that IVHS would bring. And the ability to continuously monitor the location of all vehicles in a fleet of buses would prove helpful to ridership. Equipped with radio receivers, for instance, bus stop signs could display a map showing where the next bus is. The IVHS bus sign could also give an estimated time of arrival for the next bus, based on traffic conditions.

If the goal is to reduce congestion, why not just build more highways? Congestion is largely an urban and suburban problem. Available land is scarce in these areas, making new highway construction difficult and at times prohibitively expensive.

Why should the nation as a whole pay for a technology that primarily serves people who commute by car in urban areas? Because the economy of the entire nation will benefit from the resulting productivity improvement. Besides, the safety enhancements will help rural as well as urban drivers; 57 percent of highway fatalities occur on rural roads. The elderly can have their driving lives extended through aids such as infrared devices to enhance night vision. IVHS's fleet-management abilities would make it more economical to operate the specially outfitted vans that give mobility to disabled people. And small cities, which operate a modest fleet of buses, would find that IVHS makes their system run more efficiently.

What further research is needed to make IVHS real? The technology itself needs improvement in some areas. For example, we need to develop a new generation of small, reliable vehicle sensors that could process and transmit the data they gather. Also, IVHS imposes very high computational requirements. The surveillance systems collect a large amount of data, which the system must process and use in real time. Even with the dramatic improvements in computing speeds that are expected, conventional computer designs may not be up to the task. Research is underway, at MIT and elsewhere, to develop better computing algorithms and strategies. More advanced computing architectures, such as massively parallel systems, are under investigation.

Apart from the technology per se, IVHS researchers need to learn more about how drivers might behave in

this new, information-rich transportation environment. How will travelers respond to the outpouring of data and guidance from IVHS? We are all familiar with the reaction to radio traffic reports: some drivers assume that everybody else will follow the recommended alternate route, and so, hoping to stay one step ahead, they use the roads that are tied up. Will drivers still try to second-guess a sys-

tem that gives them far more up-to-date and comprehensive information? Development of such models requires comprehensive data on travel behavior that do not now exist. The various IVHS demonstration projects should provide helpful information.

As an example of the kind of behavioral research that can be done, we recently surveyed MIT employees regarding their commuting behavior. We collected data for a typical week, asking not only which route commuters took but also how they were influenced by radio broadcast traffic reports. We found that only about 20 percent of the drivers listened to traffic reports and only about 10 percent switched routes in response to personal observations and radio advisories. We expect that this percentage would increase significantly in the presence of an IVHS delivering better and more reliable information.

Another area that deserves further attention is, simply, how much information human drivers can cope with. Each feature that IVHS adds will impose some mental and physical burden on the driver. It will be important to identify reasonable expectations for drivers' mental workloads in order to minimize errors and accidents.

What might IVHS evolve into eventually? Much of what we describe here requires no scientific breakthroughs. Ultimately, however, one can envision an automated highway with platoons of vehicles running almost bumper to bumper at high speeds. But that's a long way into a cloudy future.

What is needed to make IVHS happen? IVHS is a perfect opportunity for collaboration between government, business, and academia. The public sector owns the highways, but industry needs to develop and manufacture the vehicles and the in-vehicle equipment such as driver navigation systems. We therefore need to foster a spirit of partnership more common in Japan and Germany than here.

A coherent U.S. industrial policy might accelerate the advent of intelligent highways. Indeed, the public/private partnership needed to develop and implement IVHS could serve as a model for other large technology

projects that are in the national interest. Fortunately, we already have a good start in this direction. IVHS America's 20-year plan deals with technological as well as institutional challenges and is a road map for all players, public and private.

This effort stands to make us a more economically competitive nation—not only because of the productivity boost from a highly efficient transportation/communications infrastructure, but also because IVHS, like any large engineering endeavor, will undoubtedly spawn innovations that will find their way into a variety of industries. And of course if the United States becomes a leader in IVHS development, significant overseas markets will open up for U.S. manufacturers.

How would IVHS fit with the other high-tech modes of transportation that are touted as revolutionary? IVHS is not a "silver bullet." Rather, it is part of an ensemble of strategies that we need to pursue to manage our transportation networks and services effectively. The nineteenth century was dominated by the railroad and the twentieth by the automobile and the airplane. The twenty-first century is up for grabs. In addition to IVHS, we should be developing high-speed trains, magnetically levitated (maglev) vehicles, improved public transit, advanced aircraft, and electric vehicles.

Unlike these other options IVHS involves fundamentally reshaping the country's transportation system. By drawing on dramatic advances in computers and communications, IVHS would create something basically new—a transportation/information infrastructure that would serve the nation in the broadest possible sense. ■

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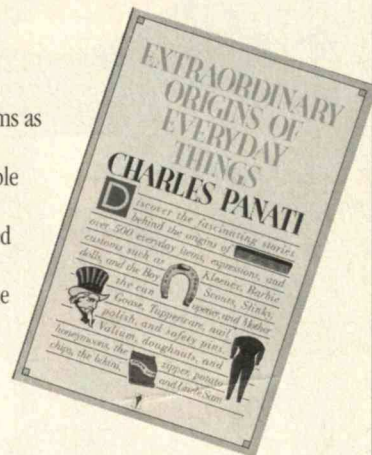
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Recycling the Plastic Package

Recent technological advances could allow most plastic to be recycled. But progress will be limited without government policies to enhance industrial demand.

ASKED to name a symbol of our throw-away society, most Americans would undoubtedly say packaging, which is the largest component of our solid waste stream, accounting for almost one-third of municipal solid waste. And the packaging material that's usually considered the worst offender is plastics. After all, plastics have been the fastest growing packaging material by far and now account for 11 percent of packaging waste by weight. They also constitute a disproportionately high volume of municipal solid waste—approximately 20 percent—which drives up the cost of transporting and landfilling it. But most important, plastics are generally viewed as unrecyclable. Only about 2 percent of plastic wastes in the United States are

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Recycling is simpler if different varieties of waste are kept separate, so new trucks for trash collection are made with several compartments (A). After the trucks are emptied (B), plastics at a state-of-the-art recycling facility—EnviroPlastics of Worcester, Mass.—are sorted by type and shredded into strips (C) that will be ground into half-inch flakes. The flakes then proceed to the “hydroclone” (D), which assures that even if an odd bottle is sorted incorrectly, the flakes from it won’t be. When the tanks shown here are filled with water, some kinds of plastic will sink while others will float.



presently recycled, while the recycling rates for the other major materials used in packaging—paper, glass, and metals—all exceed 15 percent.

The fact of the matter is that it doesn't have to be that way. To be sure, plastics recycling does present some difficult technical problems. But these obstacles are no longer so formidable: advances in plastics recycling have been taking place at a truly astounding rate, perhaps comparable to the pace of innovation in computer technology. As a result, it's now technically feasible to recycle the bulk of the plastic used in packaging, and in most cases it's economically viable as well—or could be, given the proper institutional arrangements and market incentives.

Interestingly, too, formal economic arrangements and the coordinated efforts of corporations, consumers, and government have proven highly important; many of the significant advances in plastics recycling stem from these critical steps rather than from some scientific or engineering breakthrough. And the annual number of refinements—incremental innovations—is enormous. It's worth noting as well that techniques to facilitate plastics recycling are occurring at every stage in the lifecycle of the material, not just when bags and bottles are recovered.

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Auspicious Beginnings

At the very start of the plastics lifecycle, virgin resin can be tailored to overcome the effects of future reprocessing. Plastics degrade with repeated heating or mechanical stress, and recycling imposes an additional thermal history, so that the material's durability and dimensional stability often suffer. But additives such as antioxidants can retard thermal degradation and thus help preserve a plastic's desirable properties. Also, high-density polyethylene (HDPE) can be more successfully recycled in containers for detergents and cleansers if manufacturers use a type of resin in which one part has a high molecular weight and the rest has a low molecular weight. This is one example of a strategy to increase the material's "environmental stress crack resistance" (ESCR), which means that harsh chemicals will be less likely to damage it, even after it has been reprocessed and subjected once more to the stresses of being shaped into a container. The aforementioned HDPE resin increases ESCR by more than 100 percent.

At the next stage in the material's lifecycle, packaging production, packaging can be designed to enable an increase in its recycled resin content. A common technique is to make a plastic container with several layers, some of which incorporate recycled plastic. For example, Procter & Gamble offers many of its detergents in three-layered HDPE bottles that contain 20 to 30 percent recycled plastic. The recycled resin is placed in the central layer only, so that it cannot come into contact with the harsh, crack-promoting contents of the bottle or spoil the bottle's appearance. A second approach is to make single-layer plastic containers using a blend of virgin and recycled polymers with acceptable ESCR properties. Sonoco Graham, for instance, manufactures motor oil containers using this method.



C



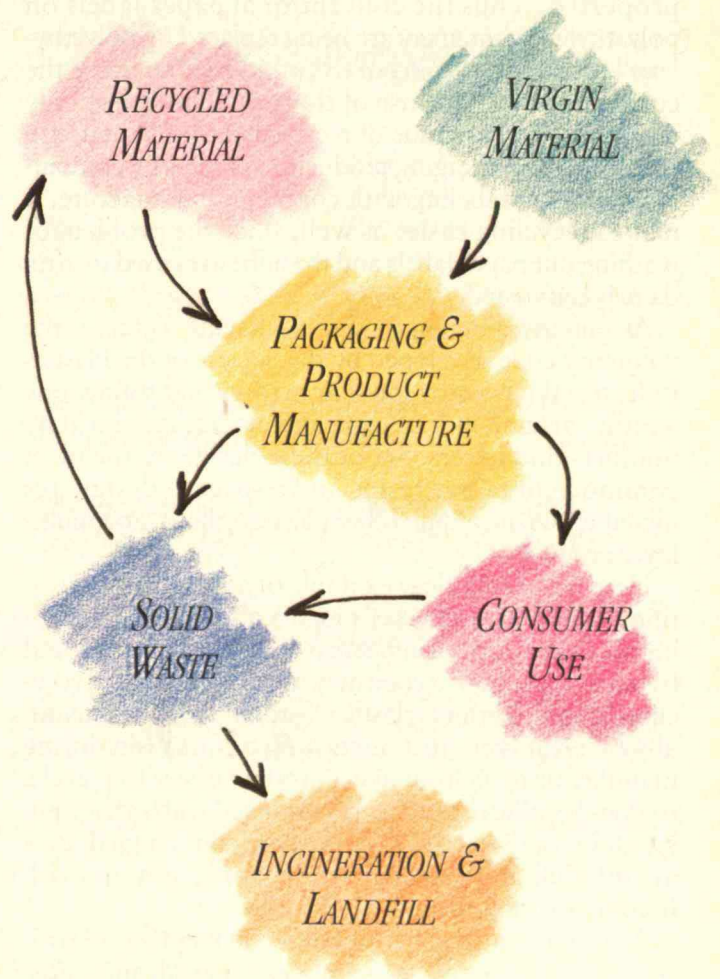
D

Manufacturers can also aid recycling by using a single resin formulation to produce each item, since homogeneous plastic waste is relatively easy to recycle. The resin-production and plastics-processing industries have, for decades, recycled their industrial scrap, which is relatively uncontaminated and of a narrow and well-known composition. Similarly, the most successfully recycled plastic packaging has been soft drink bottles made of pure polyethylene terephthalate (PET), which are diverted from the solid waste stream in states with bottle return laws. In the bottle-bill state of Massachusetts, for example, some 80 percent of PET bottles are recycled.

On the other hand, the wide variety of resins used in packaging cannot be recycled interchangeably, since they all have different physical and chemical properties and all react differently to reheating. Indiscriminate mixing of resins, or even of different grades of the same resin, generally has serious adverse consequences for the material's properties.

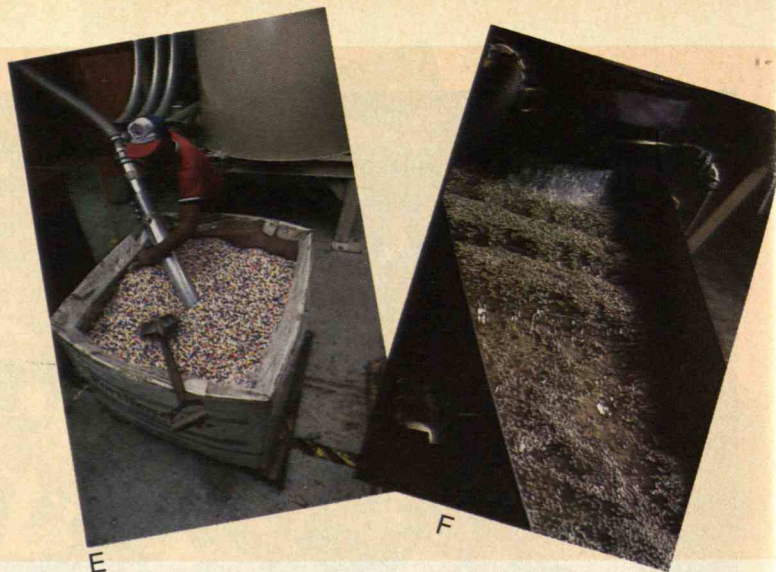
Heinz kept this single-resin principle in mind while it was developing its new squeezable ketchup bottle. Originally, the company had introduced a bottle that was perceived as difficult to recycle, since it had a seven-layer wall of different resins glued together. But the recently designed five-layer bottle consists of 98 percent PET and 1.5 percent ethyl vinyl alcohol and can be easily recycled using current PET recycling procedures. The ethyl vinyl alcohol, which is included to control oxygen diffusion, is less than ideal from a recycling standpoint, yet because such a small amount of it is used, it is not a problem.

Another set of packaging design modifications focuses on adhesives. Some adhesives, such as those typically used to affix the HDPE base cup to a PET soft drink bottle, can discolor or chemically degrade the resin during recycling. However, new "hot melt" adhe-



Innovations to enhance recycling can occur at any stage of the materials' lifecycle, shown in this diagram. Note that just as consumers can recycle their waste, so can manufacturers.

Once sorted plastic flakes are dried out, they're siphoned away (E) into a machine that turns them into pellets. The molten pellets that emerge (F) are cooled by water and finally shot into a shipping box (G) for sale to firms in the market for recycled plastics. What the pellets look like depends on what they're made of. White pellets, for example, are the product of clear flakes, while those that are grayish brown result from flakes of mixed colors (H).



sives, which are chemically inert and thermally stable, do not create these undesirable effects.

Paper residues, even in minute amounts that might remain after washing, can lead to a degradation of resin properties. Thus the conventional paper labels on polyethylene containers are being replaced by polyethylene labels that are part of the mold used to make the container itself. The use of the plastic label not only results in a higher grade of recycled plastics, but it also simplifies the packaging production process by combining container labeling with container manufacture. It makes recycling easier as well, since the problem of washing out paper labels and the adhesives used to affix them is eliminated.

An entirely different kind of packaging feature is the voluntary code developed by the Society of the Plastics Industry: the by-now familiar arrows that follow one another around in a triangle and are accompanied by numbers and letters. Six of these designate the most common container resins and a seventh designates mixed waste, including other plastics, alloys, and multi-layer products.

Here we have a clear example of a recycling innovation that works largely because of coordinated efforts—in this case, cooperation across an entire industry. And trivial as the idea of a code may seem, it's crucial to recycling, since it permits plastic wastes to be sorted manually by resin type. Just as sticking to one resin during manufacturing helps make a product easier to recycle, so does keeping that one resin unmixed with other resin types. Once discarded materials are commingled, they are difficult and expensive to separate, and they risk becoming contaminated.

The coordinated activity of different members of society is also responsible for many recycling advances arising at the stage in the material lifecycle when solid waste is collected and recyclables are separated out. For example, cooperation is key to the success of bottle return programs, polyethylene-bag collection programs at grocery stores, and polystyrene-food-container collection programs for high-volume commercial and institutional

users. State and local governments are beginning to play an important role as well—by enacting bottle deposit legislation, requiring some recyclables to be separated from the stream of solid waste, and providing curbside collection of such materials.

Incremental technical advances have aided collection, too. For instance, redesigned collection vehicles facilitate the loading of recyclables and allow workers to store them separately and compact them on board. Another noteworthy innovation is the reverse vending machine, which, by ingesting empty PET bottles and returning the bottle deposit, offers convenient, automated bottle return.

Closing the Loop

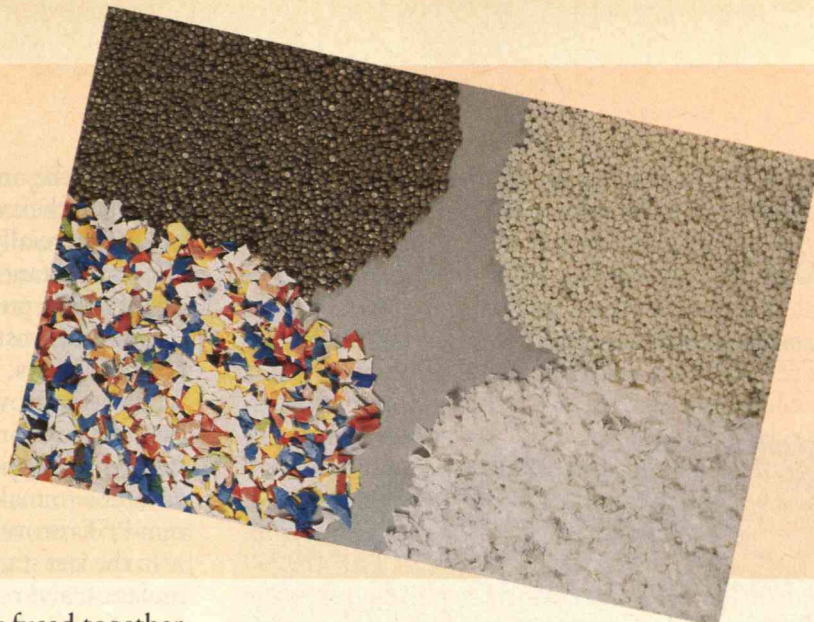
During the next stage in the material's lifecycle, recyclable plastic that has not been separated from the stream of solid waste is extricated from other material and purified. Actually, even plastic that has been separated out needs to be washed and rinsed to eliminate gross impurities such as food that can cause the material's properties to degrade significantly. Other undesirable matter can be removed at the same time. For example, in wet reclamation systems, PET bottles are shredded, paper from the label is removed by air filtration, and the remaining material is separated by water floatation. PET and aluminum sink, and HDPE from the basecup floats to the top and is removed. After drying, the aluminum and the PET are separated electrostatically: the PET and aluminum chips are charged by a high-voltage electrode, but only the PET chips hold the charge.

One especially innovative technology used in sorting out commingled plastics relies on centrifugal force, which segregates materials of different densities. This is useful in separating out "polyolefins"—in other words, polyethylenes and polypropylene—which are lighter than other plastic waste. And although polyvinyl chloride (PVC) and PET, which have similar specific gravities, cannot be separated using such a technique, that problem has not proven insurmountable, at least as long



G

H



as the PVC and PET are not somehow fused together. PVC-PET separation systems have been developed based on electromagnetic scanning techniques that detect the chlorine in PVC. Robots or other mechanical devices can then be used to separate the two different kinds of plastic.

Eastman Chemical has recently developed a technology for automatically sorting all plastics according to resin type—they would be electronically scanned for organic marker compounds that manufacturers would incorporate into the virgin resin. Though potentially very useful for automating the separation process, such a technology would require industrywide cooperation to be really effective: if many companies failed to incorporate the marker compounds into their resins, the electronic scanner would be able to read only part of the plastics stream, and the separation process would be undermined.

Perhaps the most powerful set of resin recovery systems to be developed are based on chemical processes. These allow achievement of the elusive and highly desirable goal of “closing the loop” in plastics recycling. That is, they make it possible to use recycled resins in the same application as they were used originally. One example is depolymerization systems, whereby heat and pressure are applied to plastics in the presence of specific chemicals such as methanol. That causes the polymer chains to break down into their monomeric constituents, which can then be repolymerized to produce virgin resins. Goodyear, DuPont, and Hoechst Celanese have already used this principle to develop processes that depolymerize PET flakes into the basic monomers ethylene glycol and terephthalic acid. Other depolymerization processes are under development to allow polyolefins, polystyrene, and polyvinyl chloride to be broken down into their constituent parts.

A second set of methods based on chemical processes leaves the polymers intact but separates them out from one another even if they are commingled. These methods rely on the principle that different polymers dissolve in different solvents, or even in the same solvent, at dif-

TYPES OF PLASTIC RESIN

RESIN	MAJOR TYPES OF PACKAGING	TYPICAL APPLICATION
Low-density polyethylene (LDPE)	Film, coatings	Grocery bag
High-density polyethylene (HDPE)	Bottles, film	Motor oil container
Polyethylene terephthalate (PET)	Bottles	Soda bottle
Polyvinyl chloride (PVC)	Containers, film	Shampoo bottle
Polystyrene (PS)	Containers	Food container
Polypropylene (PP)	Film, containers	Cereal box liner

The wide variety of plastics used in packaging all have different physical and chemical properties, and all react differently to reheating. Thus they have to be kept separate during recycling.

THE SOCIAL BENEFITS OF RECYCLING

SOURCE OF BENEFIT \$/TON

Avoided subsidy to virgin materials	\$3
Avoided cost of incineration	\$202
Avoided cost of landfilling	\$63
Recycling revenues	\$49
Recycling costs	(-\$86)
TOTAL	\$231

According to the authors' calculations, recycling pays. Consider, for example, avoided costs of landfilling and incineration. Some 30 percent of the waste stream would otherwise be landfilled, and at \$209 per ton, the bill would come to \$63. The remaining 70 percent would be incinerated, and that practice is even more expensive—\$289 per ton—yielding a cost of \$202.

ferent temperatures. For instance, in one process developed at the Rensselaer Polytechnic Institute, a plastic mixture is exposed to a solvent at a certain temperature to dissolve one of the types of plastic. The solvent stream is then quickly evaporated to recover the dissolved polymer and the pure solvent, and after that, the cycle begins again—with the difference that the temperature goes up and a different type of plastic is dissolved. In each successive loop of the cycle, as the temperature of the solvent is raised higher and higher, still other polymers in the resin mix are dissolved. This allows the recovery of most common plastics.

The majority of systems based on chemical processes,

including the one from Rensselaer Polytechnic Institute, are still in the experimental stage, but if they turn out to be commercially viable, they would advance recycling efforts substantially. Not only would they allow recovery of nearly pure polymers or their constituents from a mixture of wastes, but the reaction conditions destroy contaminants, so that the recovered material could, with the approval of the Federal Drug Administration, be used to store food. And in fact, this has already started to happen: the FDA recently allowed Hoechst Celanese to make Coca-Cola bottles containing 25 percent PET recovered by depolymerization.

In the last stage in the material lifecycle, plastics reformulation and reprocessing, products and packaging are manufactured using recovered plastics. Plastics reprocessing has benefited from the myriad incremental innovations in reprocessing equipment. Just one small example is special agitators to facilitate material flow. The plastic that gets reprocessed in a recycling facility is full of irregular edges and odd outcroppings, and in the past, pieces of it would get caught on the reprocessing machinery, so that the flow would become clogged. But if the material is agitated a little, it doesn't have as much of a chance to get caught.

Post-recovery plastics reformulation has been improved primarily through the technologies used for developing high-value virgin plastics—in other words, additives that enhance the material's mechanical properties. These include "block copolymer compatibilizers," which are soluble in more than one polymer resin and therefore allow such resins as PET and HDPE to be blended. This can result in alloys such as super-tough PET/HDPE blends formed from the components of soft drink bottles. Another class of additives that is beginning to find applications in reprocessed plastics is "impact modifiers." Among these are "reactive" impact modifiers that chemically bind onto matrix polymer chains; in commercially available varieties, for example, this ability can lead to an increase of up to 1,000 percent in the strength of reprocessed nylon under impact.

Traditionally, recycled plastics—often commingled reclaimed polymers—have been able to compete favorably with virgin resins only in low-performance uses. And low-end markets—for products such as flowerpots, drainage tiles, corrugated pipes, trash cans, trash bags, fiberfill, and plastic lumber—have been expanding rapidly. Still, the inherently low value of such products does not provide enough of an economic incentive to spur widespread recycling efforts. Furthermore, these markets represent only a minuscule fraction of total plastic use and hence only a limited commercial outlet for recycled resins. If plastics recycling is ever to become commercially successful on a large scale, recycled resins must become competitive with virgin resins in markets where products meet high standards and command a

high price. Thus in our opinion, the most pivotal technical developments in plastics recycling are those that make this possible. Advances such as depolymerization and solvent-based polymer separation are especially important, although the significance of innovations at all the other stages of the plastics lifecycle is not to be denied.

The Need for Demand

Although these widespread advances suggest a promising future for plastics recycling, serious impediments remain to all kinds of recycling—not just plastics—and they are not purely technical but also economic and political. This may seem odd considering the advantages of recycling. Not only does the practice represent an alternative to incinerating and landfilling solid waste, but it also provides manufacturers with additional material. Moreover, taking into account both the market costs of recycling and what is gained by avoiding solid waste disposal, the benefits of recycling packaging material are enormous. We have calculated that in our home state of Massachusetts, for example, the net social benefits amount to approximately \$231 per ton (*see the chart on the opposite page*).

Unfortunately, most of these benefits do not figure in market transactions. Part of the reason is that private markets do not reflect the social costs of the environmental harm they cause. Also, the way in which solid waste collection and disposal costs are financed presents a problem. In most cases, the local government assumes

responsibility, and draws on general tax revenues. Thus, even though the total costs of solid waste collection and disposal are substantial, the marginal cost directly confronting those responsible for the waste is typically zero or very close to it. That fact affects decisions at all stages of a material's lifecycle. For example, a company considering whether to use virgin or recycled resins in its packaging does not have to include in its calculations the cost of disposing of the materials once their useful life is over, since society can be counted on to take care of that. The result is insufficient industrial demand for recycled materials.

State and local governments throughout the United States have tried to stimulate recycling through programs aimed at developing a recycling infrastructure. For instance, they have required recyclables to be separated from other waste, implemented curbside collection of these materials, and established material recovery facilities. But until the recovered materials are actually used—until they are converted into new products and sold to new customers—no meaningful recycling can be achieved. To be effective, government policies must widen their scope to enhance the demand for recycled materials.

One approach might be to introduce charges or taxes that would make it more expensive to forego recycling. These could be household charges for solid waste disposal, point-of-sale taxes on unrecyclable packaging, or taxes on virgin materials, for example.

Another strategy would be for the government to

Red Herrings

PLASTICS recycling can sometimes become enmeshed with other environmental issues. For example, plastics manufacturers have historically used cadmium, lead, and other toxic heavy metals to make additives such as pigments and heat stabilizers. These additives have raised health concerns with regard to both recycling and disposal, and companies have had to face the technical problem of developing less hazardous replacement additives that do not compromise the perfor-

mance of the virgin or recycled resins. Fortunately, they have been able to solve that problem. For instance, completely organic pigments have been developed to replace colorings that rely on heavy metals, and berium-zinc or calcium-zinc heat stabilizers are now available as replacements for cadmium-based formulations.

Another prominent environmental issue is biodegradability. In some cases, plastics manufacturers have modified synthetic polymers so that the molecules break down more

easily upon disposal; in others, they have made resins that include natural materials such as starch that can be attacked and degraded by microorganisms in the natural environment. However, these plastics could actually impede recycling. For one thing, mixing degradable and nondegradable plastics could result in a recycled resin of unacceptable quality, so there would be the complication of keeping the two separate from each other and from the rest of the waste stream. Also, degradable plastics might require special

reprocessing conditions. Otherwise, the stresses of the recycling process could compromise the physical properties of the resins.

In any case, the issue of biodegradability is something of a red herring, since even degradable plastics and substitutes for plastics, such as paper, do not degrade under current landfill conditions: they fail to get the air and sunlight they need. In fact, many of the so-called degradable plastics do not degrade completely even in the natural environment. ■

institute procurement policies. That is, the government could, in effect, increase its own demand for recycled or recyclable materials, perhaps by requiring that a certain percentage of the products it purchases be made of them. Or the government might simply decide, for instance, that it is willing to pay as much as 10 percent more for products containing recycled materials. The shortcoming of such policies is that in many areas, including packaging, government purchases constitute only a minute percentage of the market for a material.

A third government mechanism that could enhance demand for recyclable materials is recycling standards. These are already in place in some states: governments have required that local newspapers contain a certain percentage of recycled paper. Recycling standards have been applied more broadly still in other countries like Germany, where under a new law, 64 percent of packaging materials must be recycled by 1994. Even the American plastics industry, typically opposed to government regulation, has begun to recognize the need for such measures; this is evidenced from the editorial in the February 1992 issue of *Plastics Engineering*, which calls for demand-enhancing recycling standards with mandatory rates and deadlines for compliance.

Recycling standards should be distinguished from the unconditional bans on plastic materials that some state

and local governments have implemented. We do not support such bans. They eliminate the preferred option of recycling plastics and do not increase the demand for recovering the material that replaces them. Moreover, the substitute material may itself be unrecyclable to a large extent, as in the case of paper packaging contaminated with food, and the ban may actually exacerbate the solid waste problems it is attempting to alleviate. For example, the substitute packaging may result in more food spoilage. Finally, unconditional bans have historically been applied in a relatively unsystematic manner, making them appear arbitrary and unfair.

We expect that the most effective demand-enhancing policies would probably combine economic charges and recycling standards, perhaps with some secondary support from government procurement programs. The point, however, is that both demand-side and supply-government participation is needed. Those who object on ideological grounds to such government intervention should bear in mind that recycling provides significant social benefits and that without demand-enhancing recycling policies, manufacturers will not be economically motivated to do their share. It is also worth noting that the objective of these policies is to get government out of the business of disposing of solid waste and private industry into the business of recycling it. ■

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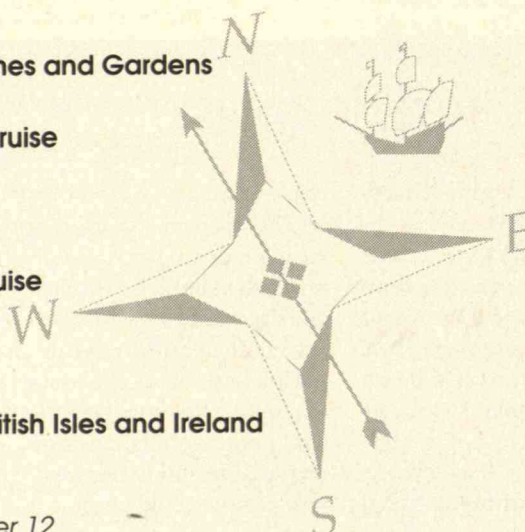
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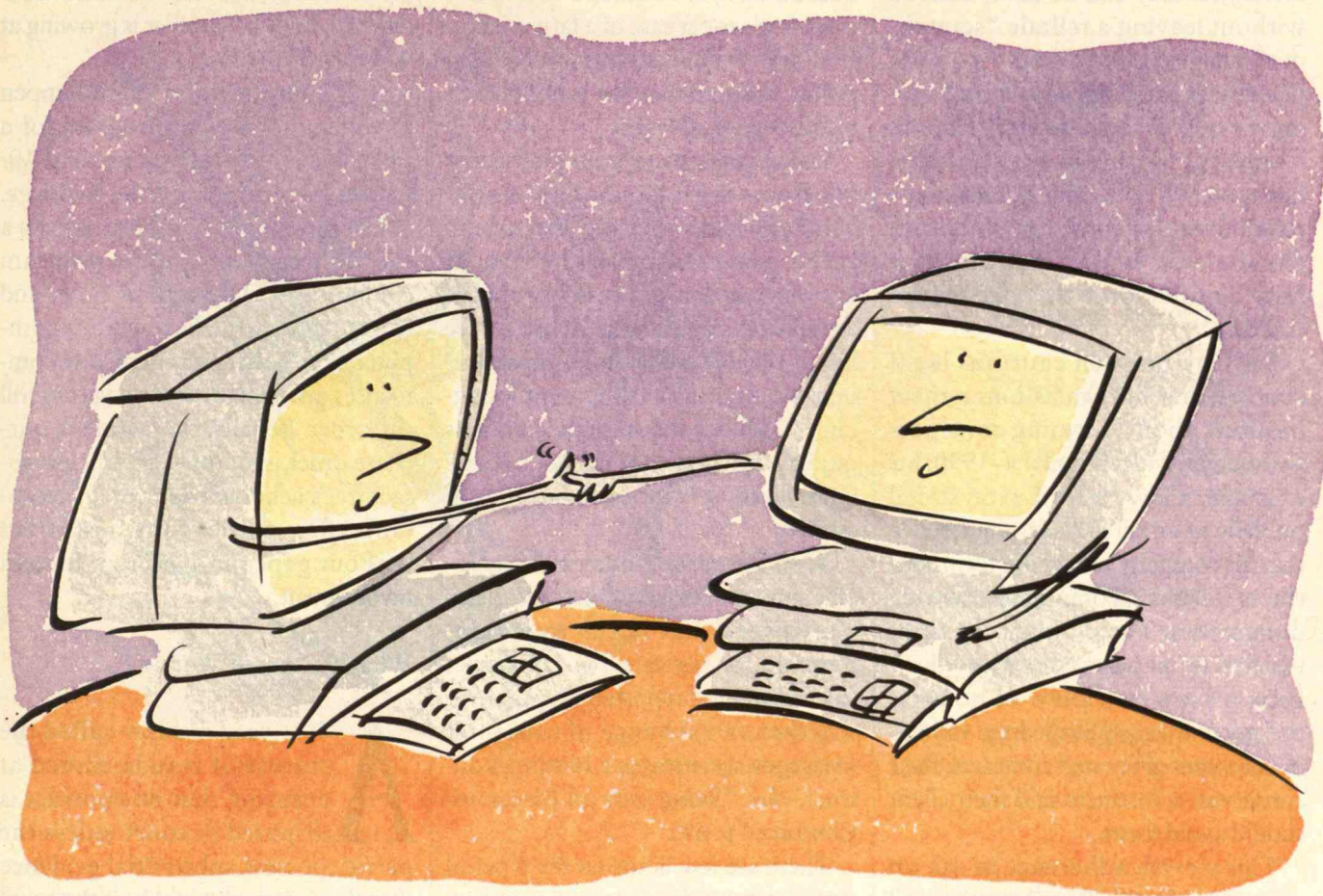
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Contracts Without Paper

Conventional legal wisdom requires ink on paper to make a contract enforceable. Businesses need to get past this anachronistic attitude as computer transactions become more common.

“Get it in writing.”

So warns a long-distance phone company in its advertisements warning consumers to distrust its competitors' promises. The meaning is unmistakable: a promise is valid only if it is printed on paper.

This long-standing creed is being challenged as businesses and governments replace paper with electronic documents, which are more economical to create, transmit, and store. But despite the technology's advantages, conventional business wisdom questions the validity of using purely electronic messages to form contracts. This doubt springs from the belief that computer messages inherently provide less reliable evidence than paper

messages: they can be easily altered without leaving a telltale "scratch-out" mark that would betray a tampered-with paper document. Embodying the conventional wisdom, Hans B. Thomsen, writing in an influential business-law text, advises businesses to confirm electronic contracts with paper—even while acknowledging how cumbersome this procedure could be.

Relying on such cautious legal counsel, many organizations remain hesitant about forming contracts without paper. As recently as 1990, for example, a lawyer for Exxon stated publicly at an oil industry conference that his company would not form contracts solely via computer-generated documents. The oil giant, he said, insisted on paper to seal every deal. Exxon's lawyers knew of no legal precedent that established the validity of computer-generated contracts; their conservative instincts said their client should avoid them.

This slavish adherence to ink on paper is evident in government as well as industry. The Bureau of Land Management—a federal agency that leases government property to the private sector—requires that all submitted requests for leases be "manually signed." In 1987, the bureau rejected a lease offer submitted by fax machine because it did not fulfill this requirement. The applicant—Reed Gilmore—appealed the decision to the Ninth Circuit U.S. Court of Appeals. Although the court ruled last November that Gilmore's application did not comply with the letter of the regulation and therefore that the rejection was proper, the judge chided the bureau for its enforcement of a meaningless and hypertechnical signature requirement. Despite the scolding, the

bureau has yet to amend its regulation—a clear-cut case of a large institution maintaining an outmoded legal policy that ignores the last decade's technological advances.

Reluctance to rely on electronic contracts is understandable—old habits die hard—but it is also uneducated and counterproductive. If appropriate data-processing controls are in place, computer messages can be just as reliably authentic as paper documents. And since computer messaging can reduce the seemingly endless paper shuffling that marks today's commerce, it is more economically efficient.

With businesses today staking sizable sums on electronic messages, legal controversy has begun to mount. Recently, for example, two companies fought the first reported lawsuit over whether an exchange of computer messages constitutes a binding contract. (See *"Suing over an Electronic Contract,"* p. 61).

There are few limits on the types of transactions organizations now convey electronically. The Securities and Exchange Commission, for example, accepts corporate regulatory filings electronically. The SEC's program that makes this possible, the Electronic Data Gathering, Analysis and Retrieval (EDGAR) system, has been operating in pilot mode since the mid-1980s. Ultimately, the SEC will require virtually all filers to use EDGAR. And cotton farmers and buyers around the world are forming paperless contracts of sale with a PC-based system called Telcot.

But the messaging format that promises the most for automating commerce is electronic data interchange, or EDI. Here, humans step back and let the computers control the whole process, automatically generating and reading such business documents as purchase orders, checks, and official regulatory filings. Some 20,000 organizations worldwide

(most of them in North America) now use EDI, and the number is growing at 45 percent a year.

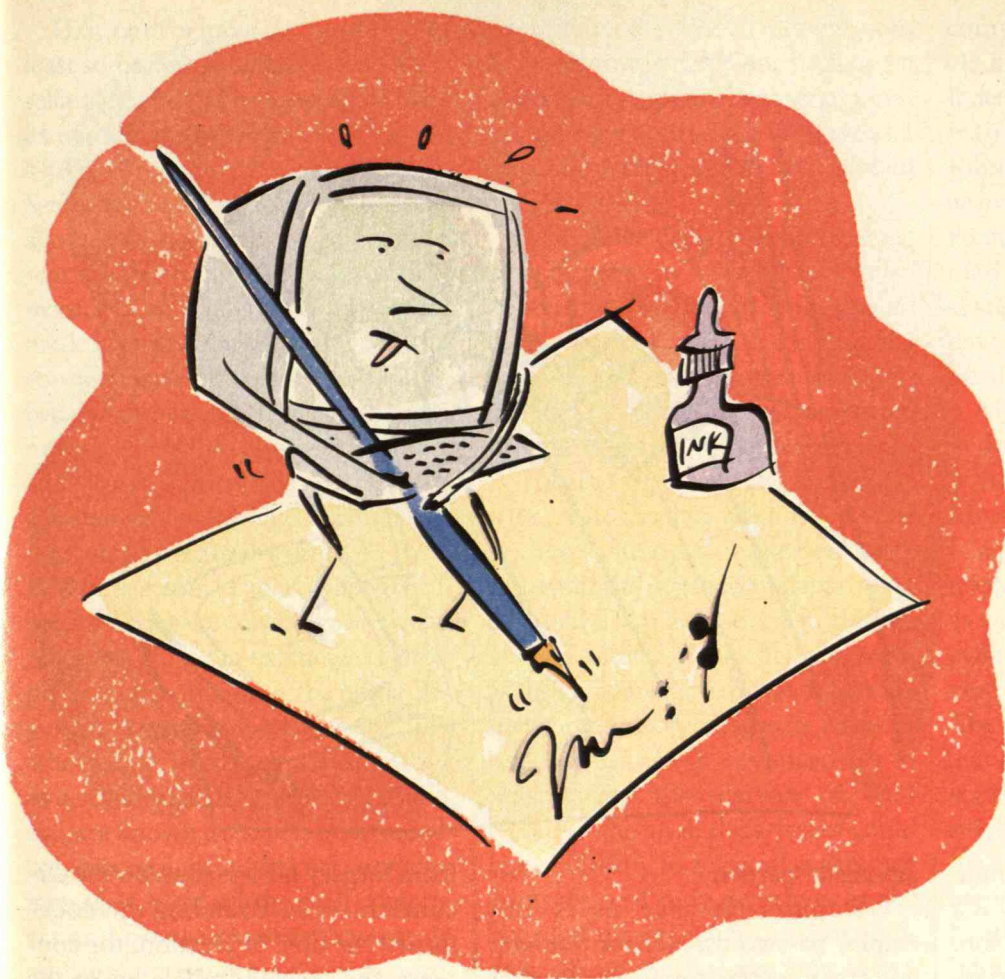
An EDI transaction might happen like this: A computer program for a retail chain monitors the sales of 10-gallon hats in the retailer's stores. When the level of hat sales exceeds a predefined threshold, the program composes an EDI purchase order and transmits it to the hat-maker's computer, which then automatically commences action to acknowledge and fill the order. Legally, the retailer's purchase order is an offer, and the manufacturer's acknowledgment an acceptance. The parties form a contract without paper and without human involvement.

What Is a 'Signed Writing'?

A 300-year-old law called the statute of frauds, aimed at ensuring that no contract is disputed in court unless the parties possess substantial evidence that the contract exists, is at the heart of the misunderstanding about the legality of computer messages. This statute—embodied in Section 2-201 of the Uniform Commercial Code, which virtually every state incorporates into its laws—says that many types of contracts are unenforceable without a "signed writing," which the statute defines as a paper document ending with an autograph.

According to standard legal thinking, the physical properties of paper and ink—such as the difficulty of changing ink marks, the unique features of handwritten pen strokes, and the chemical consistency of different grades and brands of ink and paper—enable a forensics expert to determine a paper document's authenticity. A corollary is that a simple computer message, which has no properties to prevent it from being fabricated or altered inconspicuously, cannot provide similar forensic evidence and

BENJAMIN WRIGHT, a Dallas-based attorney, is the author of *The Law of Electronic Commerce: EDI, Fax and E-mail* (Little, Brown, 1991).



Despite strong intuitive reservations from lawyers, recent cases suggest that courts are likely to accept any computer message as "writing."

thus should not be relied on as a legal document.

This thinking has a ring of logic, but it is based on an archaic view of the law. In fact, through the centuries, courts have invented many exceptions to the statute of frauds and have, in effect, read the statute off the books. The law now holds, for example, that a contract is enforceable as long as both parties admit its existence—even if no signed writing exists. A deal, after all, is a deal.

Moreover, it is not fundamentally very difficult to insure the authenticity of a business document, even if it is transmitted electronically. In fact, the prevention of forgery rarely even requires sophisticated technological safeguards. Business messages are often very specific—an order to buy 5,014 jars of picante sauce, for example, would specify date, time, quantity, flavor, price, place of delivery, and so on. To create a message that is not

obviously fake, a forger must know a great deal about the parties. Anyone with that much knowledge would, of course, be an early suspect if anyone were to uncover the wrongdoing.

Adequate Safeguards

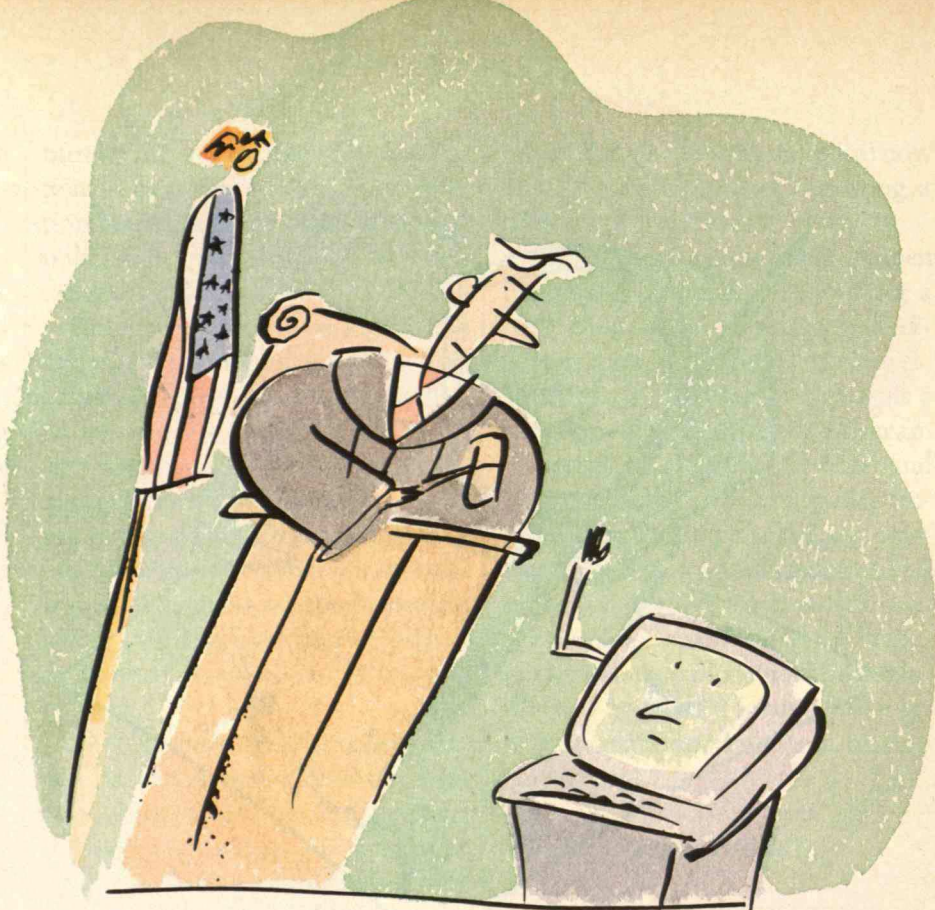
Password schemes provide further protection. Two users can agree to use a password in their messages to establish authorship. Banks, for example, have long relied on a special kind of password to authenticate the telex messages used to transfer funds. The sender appends to its message a "test key"—a number that represents the product of a previously agreed-upon mathematical formula based on a regularly changing set of numbers from a code book and a portion of the contents of the telex message, such as the dollar amount of the funds involved. The recipient verifies the message by

recomputing the test key and comparing its version with transmitted the test key. Any alteration of the telex contents during transmission would be apparent because the original test key and the recomputed test key would not match.

Callback routines can provide another form of security. The message-sending computer calls the computer of the intended recipient. Then the second computer calls the first computer back at its secret telephone number. This procedure makes it difficult for an electronic intruder to masquerade as a legitimate user. (When the second computer calls back, it can, if sophisticated enough, detect that call-forwarding is being used—and if so discontinue the call because it is not going to the intended telephone number.)

Encryption can offer still greater security. One of the most promising technologies is public-key cryptography, whereby the transmitted data are

*Many courts
have ruled
that telegrams,
mailgrams, and
telexes qualify
as "signed
writing."*



scrambled with one key and unscrambled with another key. Each key is a number that, when incorporated into a specified algorithm together with numbers representing the content of the message, permits the message to be coded or decoded.

Under a public-key system, a neutral party assigns the message sender both a scrambling key (which is kept secret) and an unscrambling key (which is made public). Senders use their private keys to scramble their outgoing messages. The receiver tries to unscramble the message using the sender's public key—an endeavor that can succeed only if the message came from the expected sender and if the message has not changed since the sender released it. (Although the two keys are mathematically related, it is virtually impossible to derive the private key from the public one.) Thus no one can forge a message and claim it came from the sender. Although highly effective, public key cryptography is not widely used in commercial electronic messaging because it requires considerable advance coordination

among the parties.

Computer-message users can employ passwords, callback routines, and cryptography, together with other authentication methods, in different degrees and combinations. Determining which blend of safeguards is best boils down to a decision balancing the risks of fraud against the expense and inconvenience of using one combination or another.

This judgment call is a familiar one. In conventional communications, we choose from a variety of devices to authenticate paper—single signatures, dual signatures, witnessed signatures, safety paper, notary stamps, bank signature guarantees, and so on. The combination we choose for any particular document depends upon a similar balance of risk versus expense and inconvenience.

The most popular paper authentication device—a single handwritten signature—is itself rather weak. Signatures can be forged, and message recipients rarely check them against specimen signatures. The truth is that signatures secure paper documents

from forgery far less than do the circumstances surrounding the documents: the time of creation, the contents, the special knowledge of the parties. This experience with paper suggests that for many routine legal transactions, electronic messages need not require extremely robust authentication. Cryptography, for example, is seldom necessary.

Evidence in Court

Even if messages can be authenticated, conventional legal wisdom still protests that since computer records can be changed after their creation, they do not suffice as legal evidence.

But this argument misunderstands the role of courtroom evidence. Little of that evidence provides *absolute* proof of anything. Any document can be forged or altered. Any witness can lie, forget, or embellish. A judge generally requires only that a piece of evidence be "reliable," meaning that an observer has good reason to believe it, even though it may be false.

U.S. courts have decided that at least some computer records pass this reliability test and have accepted them as evidence. In a landmark case in 1965—*Transport Indemnity Co. v. Seib*—the Supreme Court of Nebraska allowed an insurance company to present in court computerized accounting records of payments the company had made over a period of years. The court considered the records reliable largely because they had been kept in the ordinary course of the company's business. The court did not require that the company show beyond all doubt that the records were trustworthy.

Where a court is particularly concerned about the reliability of a computer record, it can examine the data-processing controls in the computer system. A judge can ask, for example, whether the hardware and software, as a result of testing or broad public use, are known to be reliable in receiving, processing, and storing computer messages. Most off-the-shelf computers and programs meet this test. In addition, most computers can automatically create a log of who opens files and what modifications they have made. Alternatively, the system can

write the record of each message onto an unalterable medium, such as an optical disc. A permanent serial number on such a disc could prevent a forger from replacing the original with a bogus copy.

Controls involve more than just the computer system. Data reliability also depends on organizational procedures. Magnetic tapes containing the digital records of messages, for example, can be locked in a secure room, with the key held by a neutral person.

It is also important that the people who create the data are not the same as those who operate the computer system. If the purchasing department is issuing EDI purchase orders, then an internal audit department could serve as the company's custodian of all electronic records. To insure its neutrality—and diminish any incentive to permit the fabrication of EDI records—the audit department could report directly to a special committee composed of only members of the board of directors who are not company officers. Such segregation of corporate duties is a routine form of control in government and business.

Despite lawyers' reservations, then,

courts have become more tolerant of electronic documents as evidence. Indeed, in a very high-stakes case—the Iran-Contra prosecution of Adm. John Poindexter—the court allowed as evidence an e-mail message from Poindexter to Oliver North after the e-mail system operator explained the system's functions and the routine data-processing controls it incorporated.

Moreover, courts have been liberal in defining what qualifies as a signed writing under the statute of frauds. Many, for example, have ruled that telegrams, mailgrams, and telexes—telecommunicated messages that end as words typed on paper—so qualify, even though they do not fit the conventional image of signed writings. The senders never see, approve, or autograph the final paper, and forgery is easy. Nevertheless, courts have considered them signed writings; judges have held that the simple typewritten names on such messages constitute the "signatures" because the senders intended them as such. Thus despite strong intuitive reservations from lawyers, legal issues pose no fundamental barrier to electronic contract-

Suing over an Electronic Contract

IN the first lawsuit over a disputed electronic contract, the court in effect acknowledged the validity of computer-generated contracts.

The 1989 suit revolved around a dispute between Lederle Laboratories, a pharmaceutical company, and Corinthian Pharmaceutical, a customer. Lederle had installed an order-taking computer system, called Telgo. A customer could

place an order—without speaking to anyone and without paper—by dialing into Telgo with a touch-tone telephone.

The conflict arose over an order that Corinthian placed, via Telgo, for 950 vials of Lederle's DTP vaccine. Telgo responded by electronically issuing Corinthian an order-tracking number. The next day, Lederle raised the price of the vaccine from \$51 per

vial to \$171—and rejected Corinthian's order, which was placed at the lower price. Corinthian believed that the Telgo response had confirmed its contract to buy the vaccine at \$51 and that it was being overcharged by \$114,000—so it sued Lederle.

Although the federal district court in Indiana ruled in favor of Lederle, its decision indirectly affirmed the validity of electronic trans-

actions. The court held that Corinthian's message to Telgo was a legal offer but that the order-tracking number from Telgo was only an administrative number—and not a true acceptance. The court treated the electronic nature of the transaction as irrelevant, implying that if the tracking number *had* constituted an acceptance, the contract would have been binding. ■

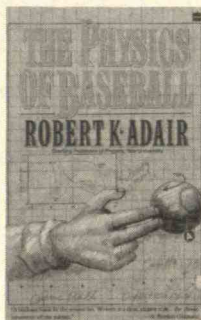
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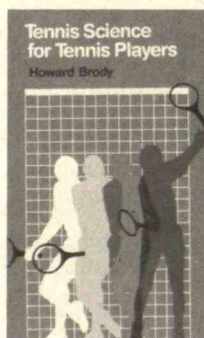
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ing; courts are likely to accept as "writing" any computer message. In one 1989 case—*Hessenthaler v. Farzin*, which ruled that a mailgram was a signed writing even though the signature on it was just a machine-printed name—the Pennsylvania Superior Court explicitly suggested that the same conclusion should apply to an e-mail message.

Technologies and procedures are readily available to insure that computer-generated messages are at least as secure as paper ones—and the benefits are clear in faster turnaround times and reduced administrative paperwork. But unlike new generations of technologies, which typically arrive on the scene every few years, the law changes at a glacial pace. The precedents set in cases such as *Hessenthaler* are likely to remain part of the legal scaffolding for decades to come. And though Exxon will probably rescind its policy against electronic contracts, according to a company lawyer, business too is shedding its reluctance very slowly.

But legislatures and government agencies can help accelerate this acceptance. Many statutes and regulations that require transactions to be "signed writings"—such as the statute of frauds—are now outdated. Although courts can read around many signed-writing requirements to permit the enforcement of electronic transactions, it only confuses matters to keep such restrictions on the books. In many cases, signed writing requirements have little meaning and should be repealed. In other cases, the requirements should be revised to permit electronic practices explicitly. They should be changed to be brought in line with modern commercial practice.

Once such antiquated laws are swept away—and once the legal community breaks free from its paper-centered mentality—then business and government organizations can enter the bright new dawn of electronic commerce. ■

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Constructive Collaboration

WHAT is one to think these days about Japanese-American relations? With leaders of industry and government exchanging insults, and pundits filling the bookstores with forecasts of calamity, the situation is troublesome, to say the least. For engineers in particular, Japan arouses a mix of disturbing emotions: admiration verging on envy, apprehension tinged with anger.

Yet public attitudes can be influenced by personal encounters as well as by headlines. I know that my own ideas about Japanese-American relations are forever affected by my experience during the months immediately following World War II.

In November 1945 I was sent with the 29th U.S. Navy Construction Battalion to Truk, an atoll in the Caroline Islands that had been bypassed by the American fleet on its westward campaign across the Pacific. A coral reef had made an invasion infeasible, so the major Japanese naval base had been neutralized by intense bombing. When the war ended, 40,000 Japanese servicemen, desperately short of food and supplies, lived in facilities reduced largely to rubble.

The surrender terms for the base were unique in that instead of becoming prisoners, as was typical throughout the Pacific islands, the Japanese on Truk were deemed "disarmed military personnel," permitted to keep their uniforms, maintain their own discipline, and live in their own camps. In return, about 3,000 of their men would remain on the island for several months to help reconstruct the destroyed facilities.

So it came to pass, that I—a 20-year-old ensign fresh out of engineering school—found myself in charge of a Japanese construction crew. While the senior officers of our battalion busied themselves with major projects such as rebuilding the airstrip, I was given two dozen or so Japanese soldiers, under the command of one of their lieutenants, and sent into the hills to build a small dam. The purpose of this structure was to impound the water of a mountain stream so that it could be pumped into a

new water supply system.

Three young Seabee enlisted men were assigned to go with me, and we four were as apprehensive about the erstwhile enemies in our charge as they doubtless were about us. None of the group—American or Japanese—knew anything about building dams, and this plus our mutual mistrust and inability to understand a single word of each other's language made the enterprise appear more than a little ludicrous.

Yet the construction of earth-fill dams is one of humankind's primordial skills, as is the technique of communicating through gesture and empathy. With the help of an old civil engineering handbook and a few suggestions from my fellow engineer-officers, I prepared a rudimentary plan and we set to work.

And how we did work! The structure, as I gauge it now from recollection and faded photographs, was about 50 feet

long at the top and rose approximately 25 feet from the bottom of a small gorge. Not exactly Grand Coulee, but to those of us to whom it was "the job," it loomed handsome and impressive. The work took about 10 weeks, and during that short time our band formed ties of mutual respect and affection that would have been impossible to anticipate.

It began with the enlisted men, who quickly established that boisterous camaraderie that seems universally to spring up among people who labor together in factories or on construction jobs. The Japanese lieutenant, who at first was fiercely proud and militarily correct, took somewhat longer to thaw but eventually became a special friend. I knew that we had achieved a breakthrough when he encouraged me to call him "Moe," an abbreviation of a very long name that I found difficult to pronounce. At the dedication ceremony that marked the work's completion, Moe surprised me with the gift of a small statue of a revered Japanese naval hero along with a message inked on a white kerchief. The English text was a painstaking translation prepared by one of Moe's fellow officers, and it said in part: "The world people say that he is the Nelson of the east. I pray that you may be able to make a great work as well as his achievement." Today the statue stands on a shelf in my office, and the kerchief, framed, hangs on the wall beside it. When I look at them, feelings of hostility toward Japan tend to fade away.

I know that this is a sentimental tale from the past, with little immediate bear-



ing on the problems of the moment. It is also a parable that contains timeless elements of hope. The moral is clear. When people from different cultures get to know each other, fear and suspicion dissipate. Further, when they work together on constructive projects, the experience nourishes feelings of gratification and good will. Is it simplistic to suggest that collaborative efforts in engineering might show the way toward improved Japanese-American relations? ■

SAMUEL C. FLORMAN, a civil engineer, is the author of *Engineering and the Liberal Arts*, *The Existential Pleasures of Engineering*, and *The Civilized Engineer*.



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The Real Council on Competitiveness

THE Bush administration believes that obliterating “bothersome” regulations will make U.S. companies more globally competitive. That’s why vice-president Dan Quayle was placed in charge of the White House’s Council on Competitiveness, dedicated to ferreting out and dismantling health, safety, environmental, and other regulations that allegedly increase the cost of doing business.

A few blocks from the White House, there is another Council on Competitiveness—this one a non-governmental organization directed by senior executives from private industry, labor unions, and universities. While Quayle’s group rails about a non-problem—after all, the countries whose competition we care about the most have more stringent standards than we do, especially regarding conditions in the workplace—its namesake is doing the kind of thinking that could ultimately bring real solutions. Not since the 1940s, when the Committee for Economic Development was created by big business to convince and cajole private industry into helping manage the war effort, has such a large chunk of the establishment so overtly come together to debate the need for economic activism.

The council sprang from a commission on industrial competitiveness that President Reagan appointed in the mid-1980s. Chaired by Hewlett-Packard chief executive John Young, the commission made a series of policy recommendations for both business and industry. Most important, it acknowledged the existence of structural problems in the U.S. economic system and maintained that some sort of industrial or technology policy was needed to correct them.

When the White House didn’t pay much attention to these ideologically discomfiting conclusions, Young and other CEOs took action themselves. In 1986, they created the Council on Competitiveness to “build consensus and cooperation within the business, labor, and higher education communities.” Under the current leadership of Motorola CEO

George Fisher, the council now comprises more than 140 corporation heads, labor leaders, and university presidents. The group commissions research, organizes policy debates, and lobbies Congress and the White House. It also publishes a useful index that periodically compares U.S. productivity, investment, trade, and standard of living with those of other countries.

In its largest and most complex project, the council is attempting to verify an often-heard assertion about U.S. business. At least since the late 1970s, advocates of industrial policy have attributed declining U.S. competitiveness in large part to the inclination of U.S. managers to focus unduly on short-term profits. In 1990, the Council on Competitiveness and the Harvard Business School jointly launched a comprehensive investigation of this question. They commissioned studies on how the

ship positions in industrial companies, which arguably contributes to the greater “patience” of the banks in those countries.) Ultimately, the council wants its members to think about policy changes that would lower the real, inflation-adjusted cost of capital and otherwise promote greater patience on the part of U.S. investors.

The results of these inquiries are only just now coming in. They are bound to be controversial, and I will report on them in a subsequent column. But enough activity has transpired to lead one to wish that the public sector was more involved in the council’s deliberations. Moreover, the union presence is still marginal enough to raise concern that the council may not be paying sufficient attention to the social consequences of the contemplated policy reforms, such as those involving the plight of racial minorities and the environment.



actual investment behavior of U.S. managers compares with that of their Japanese and German competitors. Another study reopened the possibility that it is the greater volatility of the U.S. economy—such as the rapid and unpredictable movement of interest rates—that leads American investors to demand a higher risk premium from their industrial borrowers.

The council is also investigating whether the institutional split between the ownership and management of U.S. corporations reduces trust and contributes to pushing up the long-run cost of capital. (German and Japanese banks are allowed by law to take major owner-

Despite these reservations, it is impossible not to be impressed with the political—indeed, the historical—significance of the (non-Quayle) Council on Competitiveness. That this effort has emerged in spite of White House disinterest—if not outright opposition—shows just how badly out of touch the political leadership in Washington has been. ■

BENNETT HARRISON is professor of political economy at Carnegie-Mellon University's H. John Heinz III School of Public Policy and Management. His most recent book is The Great U-Turn: Corporate Restructuring and the Polarizing of America.

Reviews

BOOKS

HOPE FOR THE DAMMED

*Water Resources Management:
In Search of an Environmental Ethic*
by David Lewis Feldman
Johns Hopkins University Press, \$38.50

BY DANIEL F. LUECKE

THREE years ago at a public meeting about a controversial dam, I found myself standing next to an official of the water utility that hoped to build the project. The hearing, held by the U.S. Army Corps of Engineers, was going well from my point of view. As an opponent of the dam, I was delighted to see person after person step to the microphone and offer unusually thoughtful and, in some cases, eloquent statements against the project. After a few hours, the water official had clearly heard enough and, turning to leave, he looked in my direction and said, "This is a terrible way to make a public decision as important as this one."

Two years later, after revising its dam study and holding another set of public meetings that were remarkably similar in tone, the Corps of Engineers announced that it had taken into account all of the public's objections. It had, it said, corrected the errors in its environmental analysis, established ways to mitigate the project's adverse impacts, and declared its intention to issue a construction permit. In the end, the Environmental Protection Agency vetoed the permit.

Having read *Water Resources Management: In Search of an Environmental Ethic*—David Feldman's plea for fundamental change in the way the United States manages water resources—I think the author would have been as amused as I by the water official's comment dismissing the public's right to be heard. I also imagine he would have approved of



the ultimate decision, though he may have been less pleased by the expensive, time-consuming, ponderous, contradictory, and wasteful process.

Feldman, a political scientist in the Energy Division of Oak Ridge National Laboratory, finds that in the name of economic development the nation's waters have been badly mismanaged. Reviewing the behavior of the major federal water-resources agencies like the Corps of Engineers and the Bureau of Reclamation, he concludes that policies and projects have been wasteful of taxpayers' money, careless in accounting for costs and benefits, indifferent to the natural environment, overly accommodating to elected officials and powerful interest groups, and unconcerned about inequities in outcomes. He sees the kernel of the problem as unenlightened self-interest—"a reliance upon narrow and often inappropriate acquisitive values that are harmful to nature and to a wide range of human needs."

To bolster his analysis, Feldman sifts through the history of a number of projects. None is as rich in its imperfections as the Garrison Diversion Project of North Dakota. Garrison was designed to irrigate 250,000 acres of farmland and provide municipal and industrial

water to communities in the state. The scheme has its origins in the late nineteenth century when Congress allegedly promised irrigation water to Dakota Territory homesteads. It was to be financed by the sale of hydropower generated by the project's cornerstone, Garrison Dam.

Only partly completed today, the diversion project is a financial, environmental, and political disaster. The dam was finished in 1956, backing up more than 28 billion cubic meters of water and inundating hundreds of thousands of acres of high-quality farm country, much of it Native American tribal land. The reservoir pool also destroyed wildlife habitat and eliminated hundreds of miles of river. The irrigation components of the project have engendered stiff opposition from environmentalists and the Canadian government, and are unlikely to be completed. But if they were, they would merely bring into production poor-quality land to grow surplus crops. In the process, more wildlife habitat would be destroyed, and irrigation runoff (contaminated with chemical fertilizers and pesticides and carrying organisms native to the Missouri basin) would be dumped into the Red River of the North, violating a treaty with Canada.

Faced with the results of this and other water projects conceived without adequate public input, Feldman concludes that water management ought to represent the interests of all parties and go beyond efficiency to account for the environmental and social costs of exploiting resources. He wants policy-making to be fully accessible to the public rather than the exclusive purview of the "iron triangle" of elected officials, bureaucrats (or elite experts), and special interests.

To achieve his vision, he proposes regional river-basin entities that derive their authority from "social contracts" negotiated among all interests. For example, urban, agricultural, recreational, and environmental representatives in a basin might organize as a board with responsibility for all uses of

water (and, presumably, land-based activities that affect water). Such bodies would operate on the principle of "reasonable fallibility"—that is, think small because water policy decisions are inherently flawed and risky—and would support themselves through user fees.

Feldman has discovered no U.S. model for such a structure. While he acknowledges that the country has made some progress since passage of the National Environmental Policy Act in 1969—particularly in the area of public access to information—he turns to France and its regional water authorities for inspiration. There he finds a balance between local control and national authority for environmental protection. The French system, established in 1964, consists of six river-basin agencies that help municipalities and industries meet water quality standards. Users are charged according to how much water they draw or discharge, and these fees, in turn, provide both an economic incentive and a revenue source for protecting and improving the region's water.

Prospects for Reform

Feldman is certainly right in his critique of the present system as inequitable and ineffective in protecting natural resources. But I'm not persuaded by his argument that we need to move "beyond efficiency," which implies to me that past policies have been efficient but wrong. In fact, very few policies or projects have ever measured up to such a standard. If the Garrison Project had to meet an efficiency test, it never would have been started.

Feldman also makes too little of the fact that there are almost always diametrically opposing positions on water use. Wise management is more than a question, as he suggests, of admitting for consideration any policy, project, or decision that benefits at least one party without harming another (so-called Pareto optimality). Nor is it simply "prioritizing goals by basing a policy on equity and integrity." Rather, it is rec-

ognizing that conflict is inevitable and must not be suppressed. To this end, decision-making forums must be accessible to all interests, and the process must be observable and understandable.

With regard to reform, I see more reason for optimism than does Feldman. Despite nagging problems, particularly in water quality, certain long-term trends have been reversed. The Bureau of Reclamation and the Corps of Engineers, two of the federal agencies with which Feldman finds greatest fault, are, for all practical purposes, out of the construction business. Shibboleths like "total river use for greater wealth" (the bureau's Colorado River motto) are plainly in disfavor with a federal government burdened by budget deficits and with citizens increasingly concerned about environmental protection. And as they have lost ground, the Environmental Protection Agency—hardly a perfect water policy agency, but better than others—has gained a more solid foothold in the water-resources arena. For example, it managed to counter the recent effort of the Council on Competitiveness to define wetlands out of existence.

Finally, the author's proposal to create regional water authorities based on a French model ignores an earlier unsuccessful experiment. In the 1960s, following the advice of several prominent economists and political scientists, the federal government created a number of river-basin commissions—notably on the Delaware and Ohio rivers—patterned after German authorities like the Ruhrverband. This semipublic agency in North Rhine-Westphalia consists of municipal, industrial, and agricultural interests and is supported by fees on water use. It oversees the quality and supply of water in the heavily industrialized Ruhr region.

The U.S. commissions, while not utter failures, never gained the political legitimacy or popular support needed for making the hard choices inherent in protecting and allocating water. Though attempting to cross state lines and bridge the private and the public sector, they



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failed to unite the numerous political interests involved. Having worked for both the Delaware Commission and the Ruhrverband, I have always felt that the idea lost something in translation.

Elsewhere in the book, Feldman identifies one of the main reasons: the "venerable tradition of antistatism" that leads Americans to resist bureaucratic control. There is also simply the problem of scale: U.S. river basins are much larger than those in Europe. I fear that the French model—which resembles the German—would suffer a similar fate for similar reasons.

Despite my disagreements with Feldman, I think his ideas deserve to be taken seriously. Even when not new, his proposals made me think about ways I might change water policy given the chance—perhaps I would get rid of sub-

sidies for agricultural irrigation and hydropower, or impose full-cost fees for all discharges. And in offering an alternative that goes beyond what another author has termed "the calculus of material self-interest," Feldman puts his finger on one of the greatest weaknesses of the current system. ■

DANIEL F. LUECKE is senior scientist and director of the Environmental Defense Fund's Rocky Mountain office, in Boulder, Colo.

BOOKS

ADDRESSING PUBLIC
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*The Fail-Safe Society: Community
Defiance and the End of American
Technological Optimism*

by Charles Piller
Basic Books, \$19.95

BY PHIL BROWN

THE term NIMBY (not in my backyard) is usually applied broadly to people who don't want to bear social burdens or risks of any kind. Yet technological fears are a separate category deserving special attention.

Two recent examinations of NIMBYism in this context are Kent Portney's *Siting Hazardous Waste Treatment Facilities: The NIMBY Syndrome* and Charles Piller's *The Fail-Safe Society: Community Defiance and the End of American Technological Optimism*. Portney, a political scientist at Tufts University, takes up the issue of opposition to hazardous waste facilities, on which he has conducted extensive surveys.



Piller, an editor and writer on technology issues, provides case studies of three controversies: the Rocky Flats nuclear weapons plant, release of the genetically engineered organism ice-minus for protecting crops from frost, and the building of a biomedical research laboratory at the University of California at San Francisco.

Both books argue that NIMBYism is not an irrational phenomenon but a democratic expression of people's distrust of science. Yet the two authors differ in the extent to which they appreciate the magnitude of that distrust. Portney, who is hopeful that risk analysts and communicators can come up with better approaches to entice communities into accepting risks, underestimates the impact of recent dramatic failures in the scientific enterprise. Piller sees the conflict between NIMBY interests and the scientific community more for what it is: a clash of cultures that can be resolved only by increasing public oversight and reducing actual risks.

New Risks for Old

As Portney shows, public opposition to hazardous waste treatment facilities is so strong that governments and private operators are finding it

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virtually impossible to site them. From surveys he conducted in five Massachusetts cities and towns, as well as nationwide, Portney observes that about half to three-quarters of his respondents would not want a hazardous waste facility in their community. The task he sets for himself is to discover who these opponents are and what would change their minds.

Portney finds that among those who oppose facilities anywhere in their state, the strongest unifying factor by far is perceived health threats. People with low income also tend to take this stand, as do women (especially if they have children). But among true "NIMBYs"—those who would accept a treatment facility somewhere in their state but not in their own community—the defining traits are different. Although fears about health

threats are again high on the list, the most likely opponents of local facilities are long-time residents who are knowledgeable about environmental issues and—surprisingly—belong to the Republican Party.

Portney seems hard pressed to explain this breakdown of characteristics, and is even more bewildered by people's responses to hypothetical questions about factors that might mitigate their opposition. The offer of risk-reducing actions, such as allowing citizen inspections, prompts few people to accept facilities. Economic incentives, such as the promise of local hiring, are even less effective. Quite simply, there are few arguments or promises of benefits that diminish public distrust. Even inviting the public to participate in siting decisions does not work, since people

generally decide they want to keep facilities out.

Because he sees such hardness in people's positions, Portney eschews attempts to change attitudes and perceptions. Instead, he offers solutions based on "risk substitution": parties attempting to site a treatment facility should offer to remove an existing risk in exchange for creating a new one. For example, a facility might be proposed in an area already identified as a toxic waste Superfund site, which would then be cleaned up by the new plant. Or a facility might be sited in exchange for closing down a nearby chemical plant. Of course, as Portney himself acknowledges, people might push for cleanup or plant shutdown *without* adding a new risky setting. Still, one might say that if other

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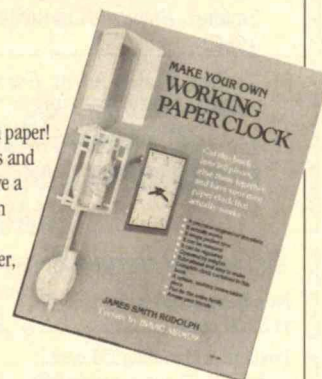
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REVIEWS

approaches have not worked, why not try this one?

The answer is that risk substitution does not serve the public as much as government and the waste industry. Indeed, Portney sees as a prime benefit of risk substitution that it does not require changes in value structures or political processes. Yet these are precisely the sort of changes required to overcome widespread distrust.

Reducing Risks

Much of the American public has reached a "trust threshold" in its view of science and government. People no longer believe that science offers benign social progress or that government protects them from unwanted hazards. On the contrary, the popular perception is that the more science and technology wound us, the more government fails to protect us—and the more government fails us, the freer are the reins given to science.

Charles Piller understands this. He views NIMBYism as the inevitable result of conflict between the "technical rationality" of science and government and the "cultural rationality" of the public. Technical rationality trusts scientific methods and explanations, appeals to expertise, depersonalizes risks, and takes seriously only those risks that can be specified and measured. Cultural rationality trusts democratic processes more than scientific ones, appeals to folk authority and community traditions, personalizes risks, and dwells on unanticipated hazards.

In this clash of cultures, the presence or absence of quantifiable dangers is often beside the point. When NIMBY forces have the facts on their side—as they do in opposing nuclear weapons plants, given the numerous accidental and even intentional releases of radiation—so much the better. Yet even when local activists overstate the risks of a scientific undertaking, Piller maintains that their skepticism is understandable.

Critics of UCSF's proposed Laurel

Heights biomedical lab were wrong to equate its danger with that of nuclear weapons plants, Piller writes. But he takes this as a "backlash against aloof, unresponsive, undemocratic conduct of all manner of institutions that control science and technology." The real problem in that case, he argues, was the university's deceit in the planning process—it never told residents it intended to build the laboratory. In the public mind, hubris in planning and communicating is evidence of dangerous science.

In fact, says Piller, public suspicions are so deep that compensation approaches like Portney's risk-substitution strategy can only be short-term solutions and will not diminish local outrage. Piller's own prescription is much broader. For one thing, he writes, siting decisions must be made with early and meaningful public participation, rather than the typical pro forma methods where technical reports predominate over human concerns. Most important, he calls for a drastic revision of health and safety standards so that they protect public and worker health at least as much as they protect corporate wealth. For example, risky industries must have continuous monitoring and epidemiological studies, with direct public oversight.

Piller, who says he started his research from an anti-NIMBY position, came not only to support such groups but to argue that labeling NIMBYism as the problem distracts us from the causes of hazards. "For all of its strident excess and bluster," he writes, "NIMBYism has been benign indeed compared to the forces that have provoked it." Besides, even if the fears behind NIMBYism are sometimes misguided, the occasional ill-conceived community opposition movement may be the price one pays for democracy. ■

PHIL BROWN is a professor of sociology at Brown University and coauthor of No Safe Place: Toxic Waste, Leukemia, and Community Action, a study of the Woburn, Mass., toxic waste controversy.

(whatever that means). There are just as many couch potatoes watching TV here.

Deriding U.S. culture has been common since the days of the "grand tour" of Europe. Let's not add derision of leisure to that.

LESTER A. GIMPELSON
Brussels, Belgium

TEMPEST IN A COFFEE CUP

In "The Haze Around Environmental Audits" (*TR Trends*, April 1992), Stephen Strauss erroneously links polystyrene foam cups to CFCs. But such cups have never contained or produced CFCs. Extruded foam packaging was sometimes made with CFCs, but now it's made with other substances.

Also, there has been no evidence to show that the styrene in polystyrene is a carcinogen. And the U.S. styrene industry is considerably larger than 43 million pounds—it's more like 11 billion pounds. About half of that is made into polystyrene. Less than 200 million pounds are made into foam cups.

Finally, polystyrene foam is non-biodegradable, but so are glass bottles and aluminum cans. In a modern landfill, so is a paper cup and pretty much everything else. Archeological digs in landfills have unearthed 30-year-old newspapers, steaks, hot dogs, and corn cobs.

On the other hand, polystyrene is the only food service material being recycled. The National Polystyrene Recycling Co. (NPRC) is operating four regional recycling centers—each with a capacity of 13 million pounds—and these facilities are currently cleaning and reprocessing 20 million pounds of the material every year. Huntsman Chemical Corp. is converting some of the NPRC's output into a kind of polystyrene with a recycle content that's between 25 and 100 percent.

PHILIP M. JACOBS
Senior Vice-President for R&D
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Editor's Note: See "Recycling the Plastic Package," page 48.

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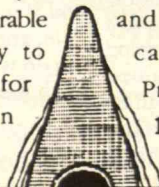
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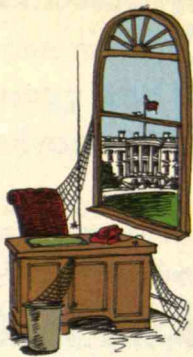
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Help Wanted in High Places

One might assume that the nation's top jobs in science and technology would be highly desirable and therefore among the easiest to fill. But according to a recent report from the National Academies of Sciences and Engineering and the Institute of Medicine, regulations restricting job opportunities after government service are severely inhibiting the recruitment process.

It now takes, on average, 9 months to fill any of the 78 presidentially appointed positions, up from 6 months during the Reagan years. Some jobs take much longer to fill. For example, it took 27 months to hire the director of the Office of Energy Research, 18 months to find a director of the National Institutes of Health, and 12 months to fill the director position at the Food and Drug Administration. Recruiters reported that in some cases, they had to turn to the 10th, 20th, even the 30th choices before finding a nominee.

Although the Ethics Reform Act of 1989 attempted to revise some burdensome regulations, the report concludes that other laws have sprung up in recent years as piecemeal responses to alleged wrongdoing. These new laws may prohibit officials from later working for any companies they have dealt with, even if they are being considered for a position unrelated to any of their previous activities. The report recommends forming an executive congressional commission to periodically overhaul the laws to make them clearer and more reasonable.

Lactic Bags

Biodegradable plastic—one product that never quite seems to live up to expectations—may be about to have its reputation saved. Researchers at the Argonne National Laboratory have developed a new plastic film, made from cheese whey and waste potatoes, that completely decomposes into lactic acid, a natural chemical found in milk and the human body.

According to Patrick Bognone, a polymer chemist at Argonne, the film has a bright future for use as compost bags, mulch films for the time-release of pesticides and fertilizers, and, perhaps most important, biodegradable coatings for paper packaging now coated with polyethylene or hydrophobic wax that inhibits or prevents paper decomposition.

The new process uses special enzymes to convert the food waste to a glucose syrup, which is then fermented with bacteria to form a lactic acid broth. After pure lactic acid is separated from the broth by means of electrodialysis, it is heated to release water molecules, leaving polylactic acid, long-chained plastic molecules, which can be formed into plastic film. The strength of the polymer chains can be adjusted to determine how long the film can be exposed to moisture before it reverts back to lactic acid.

The process can also help dispose of the more than 10 billion pounds of potato waste and several billion pounds of cheese whey produced in the U.S. each year.

Aluminum Alert

Unlike its metallic cousins lead and mercury, aluminum is included in the Food and Drug Administration's list of food additives generally regarded as safe to consume. But researchers at the University of California at Davis now suspect that in addition to aluminum's dis-

puted role in Alzheimer's disease, small amounts of the metal may also be the cause of a number of other neurological disorders.

In recent studies, toxicologist Mari Golub and her colleagues found that mice given aluminum-spiked food for 12 weeks showed lower grip strength, fewer startle responses, and general sluggishness—indices commonly related to neurotoxicity. The effects were accelerated—occurring after only five weeks—when the mice were fed the aluminum along with citrate, a compound in citrus fruits.

Aluminum is found in food additives, including certain emulsifiers, anti-caking agents, and defoaming agents. It may also leech into food from aluminum pots and pans.

Andrew Ebert, executive director of the International Food Additives Council, finds no cause for alarm, pointing out that unlike aluminum compounds used in food additives, "the aluminum salts fed to the mice were highly water-soluble, and as such have nothing to do with aluminum exposure in humans."



"The results cannot be dismissed on the issue of solubility," counters Golub, "because of the number of molecules in the human bloodstream, gastrointestinal track, and diet that can be involved in solubilizing aluminum. This is a complex process. It's not as simple as dumping something into a pitcher of water."



A Murderous Medium

If you've ever wondered just how much violence children see on TV, you may want to be sitting down for the answer. According to a new study by the American Psychological Association, by the time the average child graduates from elementary school, he or she has witnessed 8,000 murders and more than 100,000 other assorted acts of televised violence. Such exposure not only increases children's tendency to behave aggressively, but—perhaps more significant—makes them more accepting of violence inflicted by others, says Aletha Huston, professor of human development at the University of Kansas and an author of the report.

"These numbers have stayed pretty much the same for more than 20 years, which is particularly frustrating in light of the recent legislation aimed at reducing television violence," Huston says. For example, even though the Children's Television Education Act—which requires that networks demonstrate they are meeting the informational needs of children—was passed in 1990, she believes that the current administration has not been eager to enforce its provisions.

In place of government regulation, says Huston, there should be more funding for better quality shows in order to replace violent programs such as cheap cartoons, which are the worst offenders.

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